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FOREST SURVEY
RELEASE 22

March — 1959

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U.S. DEPARTMENT

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THE FOREST RESOURCES OF IOWA

CENTRAL STATES FOREST EXPERIMENT STATION
Columbus, Ohio
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Highlights

An Agricultural Economy

Iowa is one of the leading agricultural states in the Nation. Only 7 percent of the land area is forested — roughly 2.6 million acres. The eastern counties average about 12 percent forest, the western counties about 3 percent. Nevertheless, forest land has made significant contributions to the economy and can make much greater contributions through better forest management.

Forest Ownership

Farmers own 88 percent of the forest land in Iowa; public ownership amounts to less than 2 percent; the rest is scattered among many classes of nonfarm, private owners. About one-fourth of the farms have some woodland—on the average about 45 acres. Small ownerships create difficult problems in development and use of the forest resource.

Sawtimber Volume

Iowa has about 5.1 billion board-feet of sawtimber, one-third in oaks, one-fourth in cottonwood, silver maple and basswood, one-fifth in elms and the rest, a little less than one-fifth, in other species. Pine sawtimber volume is insignificant, confined mostly to plantations. This timber volume is very unequally distributed throughout the State. About half of it is found on less than 12 percent of the forest area. Looking at it the other way, more than half the total forest area contains less than 6 percent of the sawtimber volume. Large areas of overcut or neglected woodland are very poorly stocked.

Growing Stock

Iowa's forests contain about 1.4 billion cubic feet of growing stock, an average of about 7½ cords per acre. Only one-fourth of this volume is in trees smaller than sawtimber size while three-fourths is in merchantable sawtimber trees.

Condition of the Forests

Most of the forest land in Iowa is inadequately stocked and much valuable space is occupied by inferior or cull trees. Thirty-nine percent of the forest land supports sawtimber stands, 32 percent is in poletimber, and the remainder is in seedling and sapling or nonstocked stands. Almost 90 percent of the forest area bears mixtures of oak and hickory or elm, ash, and cottonwood. In general, the volume and quality of timber produced is only a fraction of the potential.

Annual Growth and Cut

Net growth of growing stock is about three times greater than timber cut. Sawtimber growth exceeds cut two to one. However, much of the annual increase in forest capital is in trees of small size or low quality. Timber cut is concentrated in the larger diameter trees of the best quality and most sought-after species. Growth and cut are approximately equal in trees 20 inches d.b.h. and larger.

Opportunity for Improvement

Stand conditions in Iowa are favorable for beginning forest management. The increase in volume apparent from the growth-cut ratio could, through known forest management practices, result in significant improvement in stocking and quality. Management would be hampered by the small size of the average forest tract and by inadequate marketing facilities. New outlets for low-quality hardwoods are needed to encourage stand improvement in some areas.

Knowledge and skills necessary for growing better timber are available to Iowa landowners through the services of public and private foresters. The number is small compared to the area needing treatment. Much economic information is needed on the economics of growing timber under various conditions. Lack of such information hampers efforts to motivate the thousands of owners of small tracts to apply forest practices on their land.

The Forest Resources of Iowa

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UNITED STATES DEPARTMENT OF AGRICULTURE • FOREST SERVICE

FOREST SURVEY RELEASE NO. 22 *Central States Forest Experiment Station* MARCH, 1959

Preface

THIS report presents the results of a survey of the forests of Iowa, a part of the national survey of forest resources. The purposes of this survey are:

1. To make a field inventory of the present supply of standing timber.
2. To find out how fast this supply is being increased through growth.
3. To find out how much it is being diminished through industrial and domestic uses, fire, insects, disease, and other factors.
4. To determine the present consumption of forest products.
5. To interpret and correlate these findings to aid in the formulation of private and public forest policies.

This survey was the first intensive inventory of the forests in Iowa so no accurate measure of changes in forest area and timber volumes is possible. Resurveys of the forests in the Central States are scheduled for 12-year intervals. Reliable comparisons will be possible as these remeasurements are completed.

FIGURE 1—*Wooded bluffs and bottomland near McGregor, Iowa.*

Background

Iowa is one of the most important agricultural states in the Nation. It leads all other states in corn production and ranks second in cash receipts from farm marketing, percentage of total land area in farms, and total value in farms (*10*)[1].

Forested land in Iowa comprises another valuable natural resource in addition to the rich cropland and productive pastures. Iowa has almost exactly 1 acre of forest land for every one of the 2,621,073 people reported in the 1950 Census.

General

Most of the land surface of Iowa is undulating to sharply rolling, frequently dissected by stream and river channels. Elevations gradually increase about 1,000 feet from the southeast to the northwest corner of the State. The Missouri and Mississippi Rivers on the west and east borders lie at the foot of relatively hilly and rough terrain.

The land-use pattern in Iowa is fairly stable at this time although there is a certain amount of conversion from cropland to pasture, pasture to woodland, and so on, going on all the time. Generally, the cropland is confined to the nearly level and moderately rolling areas; the pastures are located on the poorer soils and steeper slopes; and the forests follow the water courses or occupy rough areas (fig. 1).

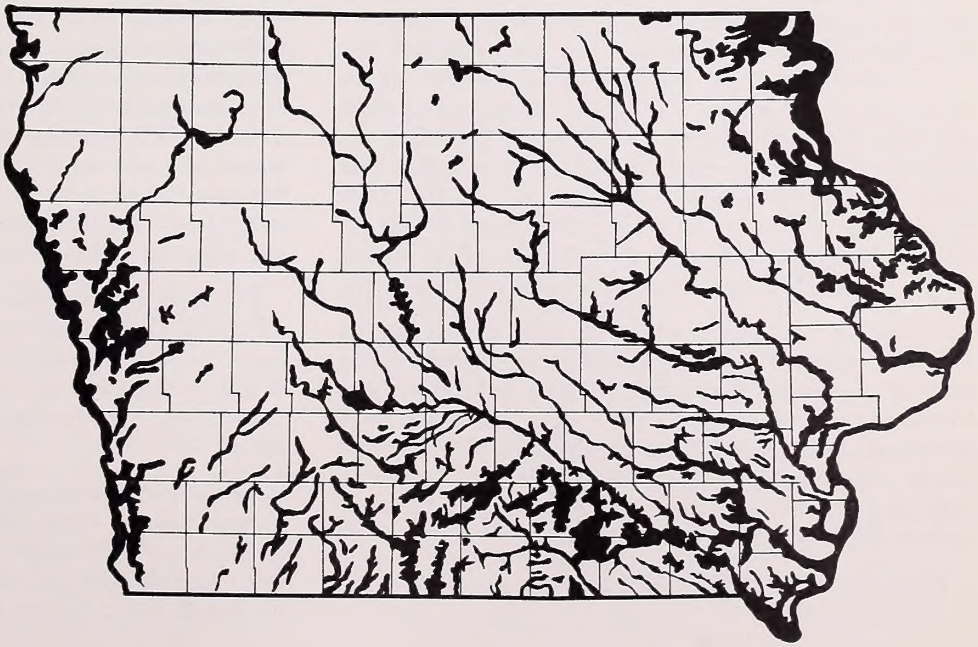
Trends in Forest Area

The forests of Iowa once covered almost 7 million acres according to the original land survey made between 1832 and 1859. Early settlers helped preserve the woodlands by controlling wild prairie fires that had periodically scarred and killed timber in that region for centuries. Moreover, since local use of lumber was relatively small, and pine logs could be rafted from Minnesota at low cost, Iowa's forests were not heavily cut in the beginning.

However, as the value of farmland increased forest exploitation began. The appearance of the portable steam engine and the rising price of pine from the North resulted in widespread clearing of the hardwood forests. Rocky knolls, sandhills, and steep, clay hillsides were denuded, pastured a few years, and then abandoned to erode and become idle land populated by weeds, brush, and scattered trees of low value. Other areas cleared were, of course, well suited to agriculture and have been developed into productive pastures and cropland. In the clearing process forest land was reduced by about two-thirds.

The present forest acreage seems to be fairly stable; the small areas still being cleared are balanced by other tracts of open land reverting to forest and by forest invading former prairie land (fig. 2). An example of this is the invasion of the bur oak forests into the loess hills of western Iowa (fig. 3).

FIGURE 2.—*Present areas of fairly continuous forest land.*



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[1] Numbers in parentheses refer to literature cited, page 26.

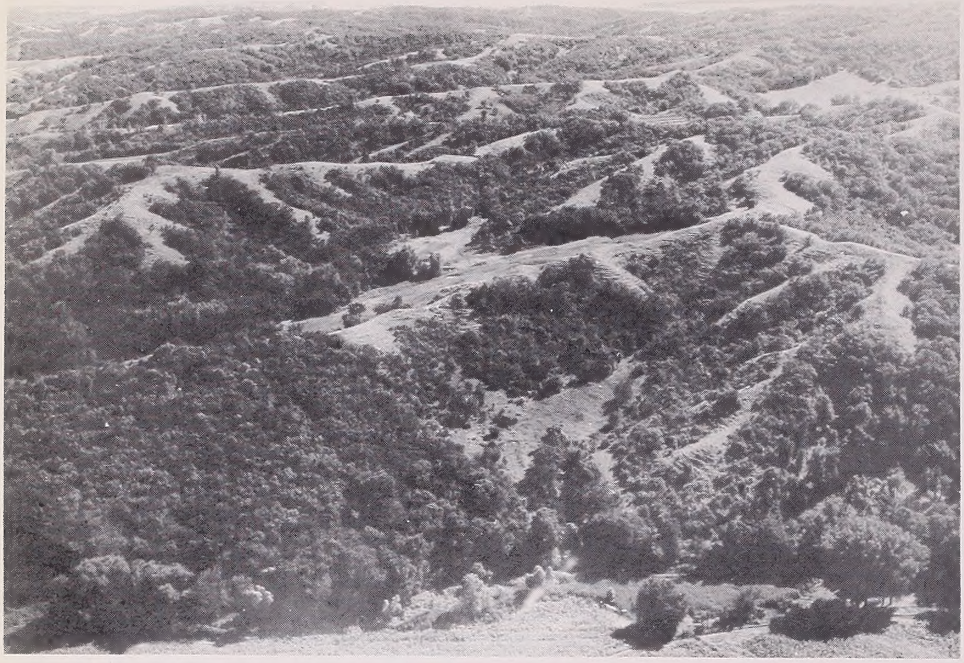

Figure 3.—*Forests invading hills of Western Iowa — Monona County.*

Forests and Land Use

For many years Iowa has been a leader among the states in recognizing and working toward the solution of agricultural problems. There was an early awareness that the maintenance of soil productivity is essential to the well being of all Iowans. Soil erosion developed as more and more land was plowed in the period following the cutting-over of the forests. By 1936 it was found that about 87 percent of the total land area in the State showed sign of erosion. Moreover, 35 percent of the original surface soil had washed or blown away—taking with it thousands of tons of valuable plant nutrients (*13*).

Experience has shown that wise land use on certain soils and topographic situations means maintaining a forest cover. For example, bottomland areas in Iowa have been laboriously cleared, cropped for a few years, and then abandoned because of losses from flooding. On the other hand, timber can be grown successfully on these same rich, deep soils because the trees are unharmed by intermittent flooding (fig. 4).

Rough areas of easily eroded soils are also well suited to forest growth.

Forests and People

Iowans have apparently regarded their forests with mixed feelings down through the years. Intense interest in forestry, evidenced as early as 1874 by the teaching of the first forestry courses offered in the United States, has been continuous in Iowa for many years. The value of trees was well known to those early Iowans making their homes in a new land with vast areas of treeless prairies. For more than a century individuals, committees, and associations have worked steadily to promote forestry and tree planting in Iowa.

Yet, despite this sustained interest it is apparent that the thousands of individuals who own 98 percent of the forest in Iowa customarily neglect their forest land. Most of the woodlands have been subjected to heavy grazing, overcutting, high-grading, and general lack of management.

The average farm woodland in Iowa covers 45 acres—in most cases an irregularly shaped tract on rough ground or along a water course. Evidently most farmers regard their wooded acres as little more than a source of shade for livestock or a habitat for game animals. When money is needed owners cut or sell all trees for which a market is available with little or no consideration for the future development of the stand. In times of prosperity the farm woodlot is usually left almost untouched, or in some cases is clear cut for pasture or cropland.

On the other hand, planting of trees for shelterbelts, windbreaks, and shade is a long established practice in Iowa. A survey made on aerial photos showed 230,000 acres of such plantings—mostly in the prairie areas of western Iowa (4). Some of them are more than 100 years old, some only one row wide. Most of the trees planted in recent years are specially selected species that are best suited to the rigorous extremes of climate. Some of them are good timber species but the average size of area planted is small and stocking is frequently low.

During the past few years, in Iowa as in other states across the country, there has been an increasing effort to re-emphasize the value of forest land. State, private, and federal organizations have joined forces to induce forest owners to rehabilitate their forests through protection and management.

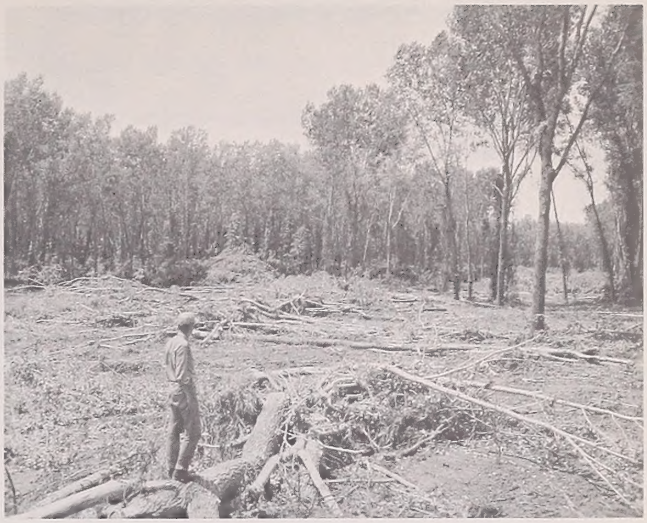

FIGURE 4.—*Bottomland sites such as this one being cleared are much better suited to growing timber than to growing farm crops.*

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Forest Area

Today, there are 2.6 million acres of forest land in Iowa—almost all of it classed as commercial forest land.[2] In addition to this area there are about 664 thousand acres of tree cover occurring in strips less than 120 feet wide and in areas less than 1 acre in size which are not classed as commercial forest land (4). Planted windbreaks and shelterbelts account for 35 percent of the acreage in these wooded strips. In general, the forest land in Iowa is concentrated in the eastern and southern portions of the State although there is a wide variation among the individual counties (fig. 5).

Ownership

Farmers own 88 percent of Iowa's forest land—more than 2 million acres. About half a million acres are in miscellaneous small private ownership.

Very little of the commercial forest land in Iowa is owned by the public. The State owns about 22,000 acres, the Federal Government about 13,000 acres, and other public ownership is negligible.

According to the 1954 Census, there were 193 thousand farms in Iowa averaging 176 acres in size (fig. 6). About one-fourth of these farms reported having some acreage of woodland—on the average about 45 acres. In the last 20 years there has been a steady increase in farm size, with the result that the average woodland area per farm has also increased slightly.

The fact that so much of Iowa's forest land is held in small tracts by individual owners is one of the greatest obstacles holding back the practice of forestry in Iowa. Light partial cuts, stand improvement work, and other practices essential to forest management are hard to sell to owners of small woodlots because the profit from such practices may not add much to the farm income. But, considering the economy of Iowa as a whole, the contribution of 2½ million acres of well-managed forests could be significant indeed.

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2) Definitions of terms used may be found in the Appendix.

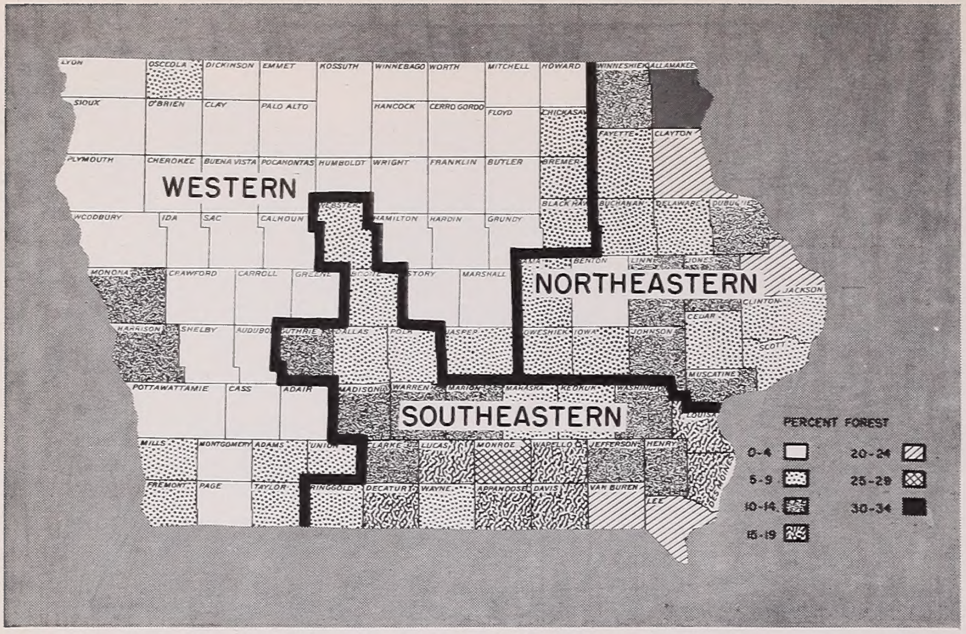


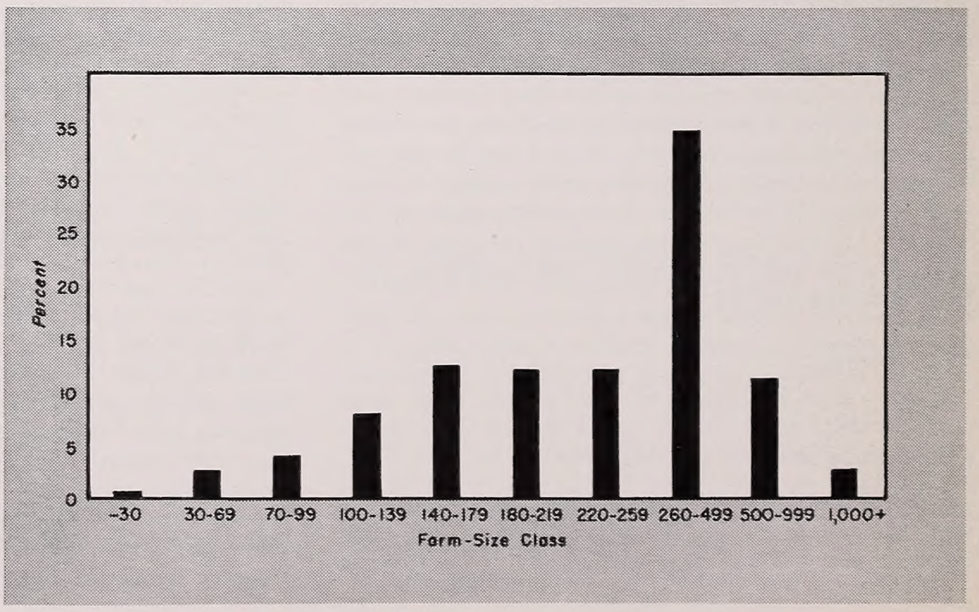
FIGURE 5.—*Forest survey regions and percent of forest land by counties.*

Forest Types

Two very general types of forests—the oak-hickory and the elm-ash-cottonwood mixtures—occupy 87 percent of Iowa's forest land. Other types of local significance are the bur oak and the northern hardwoods types. Each of these is locally important but only of minor importance in the State as a whole. The two other types recognized in the survey—aspen-birch and the hardwood-redcedar—are seldom encountered.

Forests are classified by type according to the prevalence of certain key species in the tree association being considered. Consequently, there is some overlapping of species among the general types recognized. Elm, for example, is fairly common in the oak-hickory type and certain oaks are often present in the elm-ash-cottonwood type. More specific type designations could not be used efficiently in the broad survey reported here.

FIGURE 6. — *Percent of total farmwoods acreage by farm-size class.*



The elm-ash-cottonwood type is even more complex than the oak-hickory type—virtually every commercial tree species in the State is found somewhere in this association as defined in the survey (fig. 7). Generally, this type is found along stream beds and moist lower slopes—areas more productive than those supporting oak-hickory stands. American elm, cottonwood, silver maple, slippery elm, and willow are the main components in terms of net cubic volume. In Iowa this type ranks first in area, volume of sawtimber, cubic volume, and growth potential.

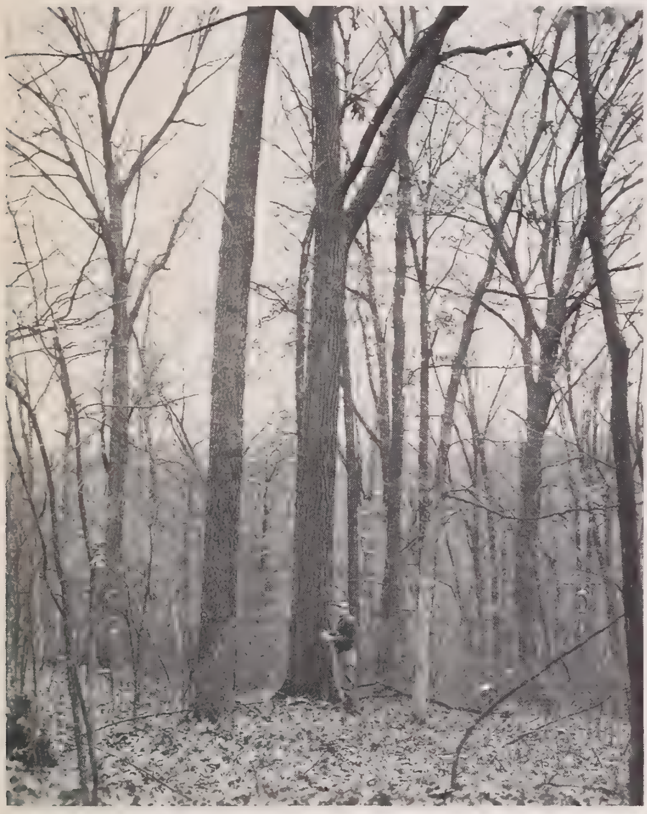


FIGURE 7.—*Oak stand in Northeast Iowa.*

The oak-hickory type is usually found on the dry upland sites (fig 8). It varies greatly in species composition. White oak, northern red oak, and hickory are the three most important species in this type in terms of net cubic volume. Black walnut is important in terms of sawtimber volume and value. Oak-hickory stands containing various species mixtures are common in all forested areas of Iowa.

The bur oak type is fairly common in western Iowa, constituting 21 percent of the forest cover in the prairie area. Bur oak is well adapted to extremes of drought and temperature; it frequently occurs in pure stands and is increasing along the Missouri River bluffs. Bur oak usually grows in relatively open stands so that the volume, quality, and growth per acre are very low.

In the heavily forested hills of northeastern Iowa are remnants of the northern hardwood forest type. The chief species of this type in Iowa are basswood, sugar maple, and northern red oak. Although it makes up only about 3 percent of Iowa's forest area, it includes some of the most valuable stands in the State. Successful forest plantations, chiefly of pines, have been established throughout the State. Although fairly numerous they were not large enough in total area to be sampled adequately by the rather thin coverage of the Forest Survey. The importance of forest plantations for land reclamation, protection, and other purposes is well recognized though planted stands are not described separately here.

Physiographic Site

Topography plays an important role in the development of forests, both directly and indirectly. For example, very rough terrain or frequently flooded bottomland may be allowed to remain in forest simply because there is no other logical use for the land. Also, the slope, exposure, and general conformation of the land have a decisive effect upon soil moisture and temperature—and thus have a direct influence upon the species composition and growth of the stand. Level, easily accessible tracts tend to be cut over more frequently, especially where farmland is marginal for field crops and farmers need extra income.

In Iowa, 61 percent of the forest acreage occurs on rugged topography with sharp ridges and deep ravines and gullies. Another 26 percent occurs on broad first or second river bottoms, alluvial stream beds and coves. The remaining 13 percent is found on level or gently rolling terrain with little or no drainage pattern evident.

The influences of topography upon site quality, stand structure and composition, stocking, growth rates, and stand size, while not well defined, are significant.

Site Quality

Stands of timber reflect the quality of the site upon which they occur in much the same way as do cultivated crops. On good sites with deep, fertile, well-drained soils, trees grow tall and increase in diameter at a relatively rapid rate (fig. 9). Trees growing on poor sites—shallow, stony, eroded areas, for example—usually are stunted and do not grow as large or as fast as more favorably situated trees.

One measure of site quality is the average number of 16-foot sawlogs produced in a mature tree. In Iowa, only 15 percent of the forest land was classed as "good" in site quality—that is, would produce an average of 3 to 3½ 16-foot logs in mature, dominant hardwood trees. About half of the forest land is fair quality—2 to 2½ log sites; and one-third of the area is poor quality—1 to 1½ logs or less. These estimates, however, tend to be conservative because present forest conditions rarely reflect the true potential of the site.

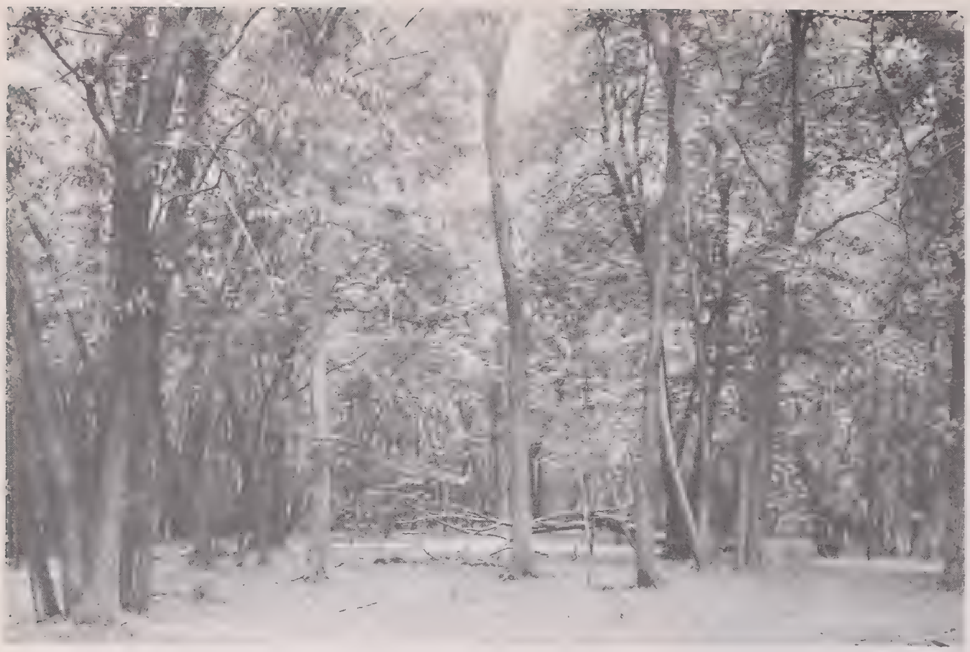


FIGURE 8. — *Bottomland forest.*

Site quality varies to some extent by geographic area—generally, sites in southeast Iowa are poorest and those in northeast Iowa are the best. A relationship is apparent between site quality and stand size. Only 11 percent of the sawtimber stands occur on poor sites but 55 percent of the seedling and sapling stands are located on poor sites. Also, 28 percent of the sawtimber stands were found on good sites in comparison to only 7 percent of the poletimber stands. These figures should be taken as indications rather than firm estimates, because of the difficulty of determining site potential on the ground.

Stand Size

One million acres of forest land in Iowa support sawtimber stands and more than 70 percent of this forest is classed as large sawtimber. In the northeast portion of the State more than half of the forest land is in sawtimber stands. It is significant that 34 percent of the sawtimber stands occur on bottomland sites which comprise only 26 percent of the forest area (fig. 10). On the other hand, there is no significant concentration of the poletimber, seedling and sapling, and nonstocked areas on any of the physiographic sites recognized. Geographically, there is a higher than average percentage of poletimber and seedling and sapling stands in southeastern Iowa. This may reflect a heavier or more frequent cutting history there. Nonstocked areas are more common in western Iowa and less numerous in the northeast.

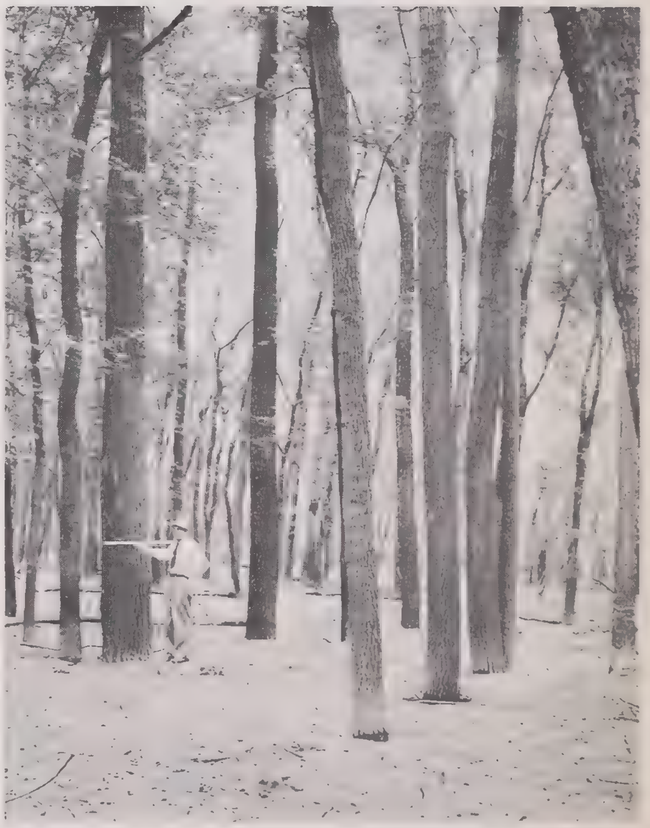
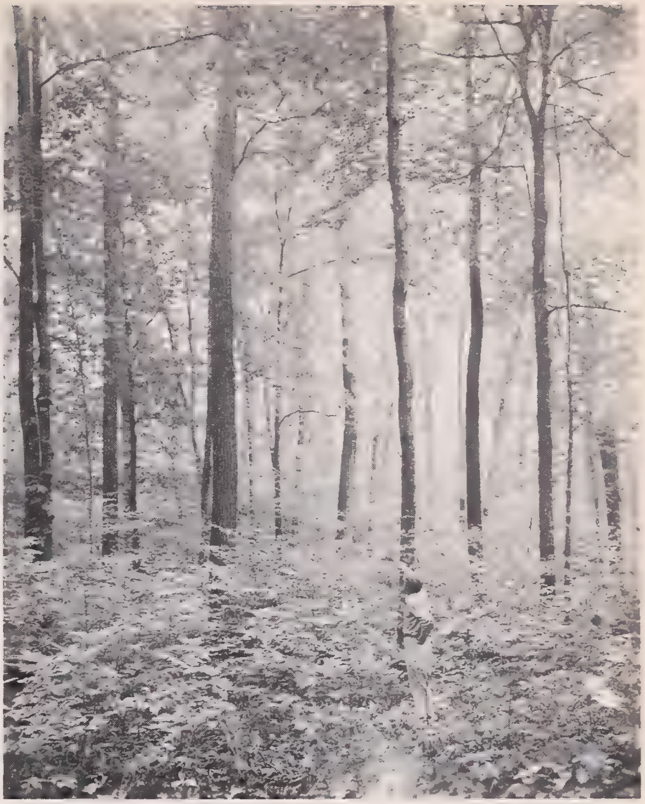


FIGURE 9.—*Large-sawtimber stand on bottomland site. The lower parts of the trees are buried in silt.*

FIGURE 10.—*Thrifty red oak-basswood-white ash stand on a good site—Clayton County, Iowa.*



Stocking

Most of the forest land is poorly stocked—that is, there are not nearly enough good growing trees per acre to fully utilize the site. Half a million acres—about one-fifth of all forest land in Iowa—are less than 10 percent stocked with trees of any size.

Stocking of the forests differs greatly by geographic region and by stand-size classes. Sawtimber stands in eastern Iowa have the best stocking, although half of those areas are not well stocked! Stocking is poorest in the poletimber stands in western Iowa—more than 80 percent of this acreage is poorly stocked.

A poorly stocked forest, like a sparsely seeded field of corn, cannot approach either its physical or economic potential. In Iowa, much of the poor stocking is a direct result of heavy grazing. Livestock kill small trees by trampling and browsing and even cause severe damage to large trees. Overcutting and other mistreatment also have reduced stocking on large areas.

Timber Volume

The volume of wood in a tract of timber, a standing tree, or a primary product such as a sawlog or pulp stick can be measured in terms of board-feet or cubic feet or both. Volumes in board-feet represent the amount of lumber that can be cut from the stand, tree, or sawlog being considered. Consequently, only trees or logs large enough to be sawed into lumber are included in this volume. Also, losses in sawdust, slabs, edging, trimming, crook, and sweep must be deducted in making estimates of net board-foot volume. Cubic volume includes all of the sound material contained in the main stem of trees, to a 4-inch top diameter. Volumes in cull trees and limbs of growing-stock trees are treated separately since they present special problems in harvesting and utilization.

Cubic-foot volumes in this report can be converted to standard cords by using a factor of 70 cubic feet per cord.

Board-Foot Volume

By Species and Forest Type

There is about 5.1 billion board-feet of sawtimber on the commercial forest land of Iowa—about two-fifths of the amount found in each of the nearby states of Minnesota, Missouri or Illinois. One-third of this volume is in oak trees, one-fourth is in cottonwood, silver maple, and basswood, one-fifth is in elms, and the rest in other species (fig. 11).

The pattern of species distribution throughout the State is very complex. Topography, climate, soils, and past cutting practices combine to produce mixtures of species in great variety. For example, in western Iowa 24 percent of the sawtimber volume is cottonwood although in the remainder of the State that species accounts for less than 8 percent. In northeast Iowa red oaks comprise 22 percent of the volume but the same species accounts for less than 6 percent in the western portion of the State. More than 99 percent of the board-foot volume is in hardwood species.

More than half of the sawtimber volume is found in the elm-ash-cottonwood type and one-third is in the oak-hickory type. The average volume per acre for the entire area in the elm-ash-cottonwood type is about 2,300 board-feet—much more than the corresponding figure of 1,600 board-feet for the oak-hickory type.

Another interesting comparison between these two important types is that three-fourths of the board-foot volume in the elm-ash-cottonwood type occurs in large sawtimber stands compared to little more than half in the oak-hickory type. The northern hardwoods type shows the greatest concentration in large trees—more than 80 percent of the board-foot volume of that type is located in large sawtimber stands.

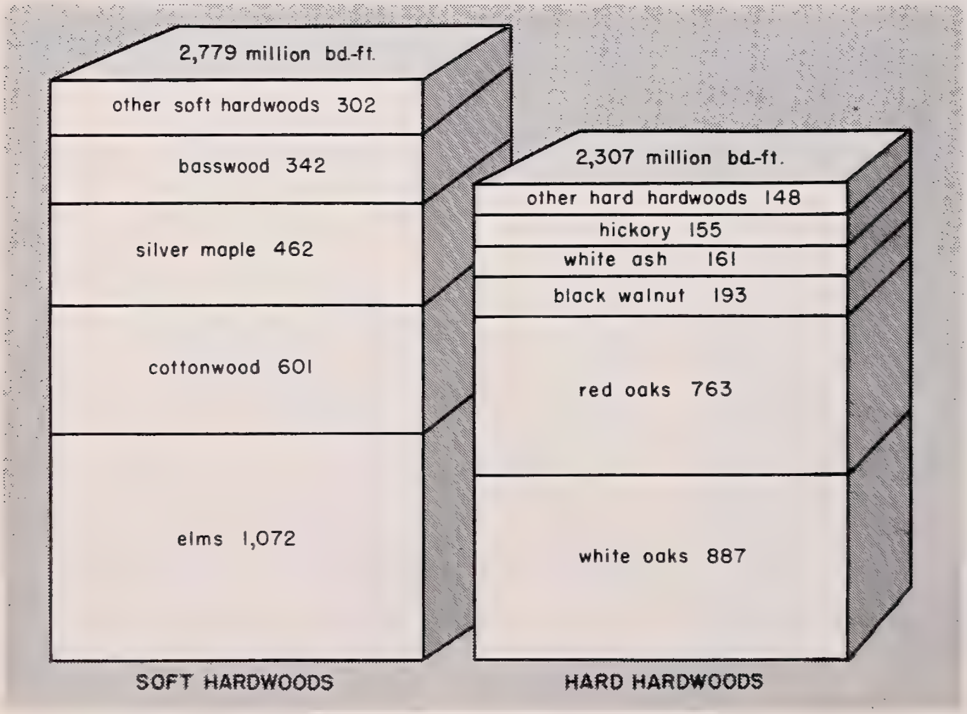


FIGURE 11.—*Iowa's hardwood lumber pile. (Board-foot volume in standing sawtimber trees).*

By Location

The sawtimber volume in Iowa is very unequally distributed. Almost half of it occurs on less than 12 percent of the forest land. Conversely, more than half of the total forest area contains less than 6 percent of the board-foot volume (fig. 12).

Physiographic location influences the distribution of timber volume. For example, about 36 percent of the board-foot volume is found on bottomland areas that account for only 26 percent of the forest area. Rough upland sites have less sawtimber volume per acre, on the average, than bottomland or level upland.

Productive capacity of the land also shows up in sawtimber volume to some extent—volume tends to be concentrated on the better sites. One-third of the board-foot volume in Iowa is located on "good" quality sites although these sites make up only 15 percent of the forest area. One-third of the forest area, classed as "poor" in site quality, contains only 10 percent of the sawtimber volume.

More sawtimber volume was found in northeast Iowa than in any other part of the State. The volume there was about two-thirds more than in the western unit and one-third more than in the southeastern unit (fig. 13).

By Tree Diameter

More than 3 billion board-feet of sawtimber—60 percent of the total—is contained in trees less than 19 inches d.b.h. These trees represent the portion of the sawtimber growing stock that should be handled most carefully to insure future crops of high-quality timber. The larger ones in this class are approaching the period in their lives when quality growth will be at its peak.

About 1.4 billion board-feet of sawtimber is included in trees from 19 to 27 inches d.b.h. Many trees of this size are economically mature and their annual increase in value is slight.

More than 12 percent of the sawtimber volume—648 million feet—is contained in trees larger than 27 inches d.b.h. Most of them are defective to some degree and few of them will increase in value if left standing. Generally trees of this size retard the growth and development of smaller individuals that could make use of the growing space more effectively.

The sawtimber volume in soft-hardwoods, cottonwood in particular, becomes increasingly important in the larger diameter classes. More than three-fourths of the cottonwood volume is contained in trees larger than 19 inches d.b.h. Oak species constitute a greater percentage of the sawtimber volume in the smaller diameters. Much of the variation in species volume between large and small diameter classes is undoubtedly due to cutting practices—both past and present. In easily accessible areas trees of preferred species are frequently harvested as soon as they reach merchantable size.

In western Iowa a greater percentage of the sawtimber is contained in large trees than is the case in the rest of the State. In eastern Iowa about two-thirds of the sawtimber volume is in the 12- to 18-inch d.b.h. class but only one-half of the volume in western Iowa is in this size class. Most of this difference may be attributed to the smaller forest area, the scattered stands, and the lack of wood-using industries in western Iowa.

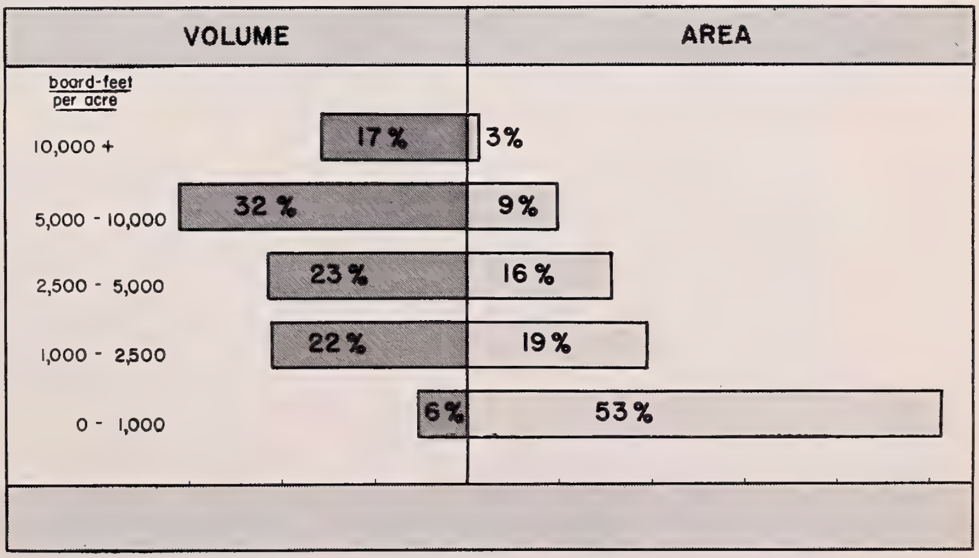


FIGURE 12. — *Sawtimber volume and forest area by board-foot volume density classes.*

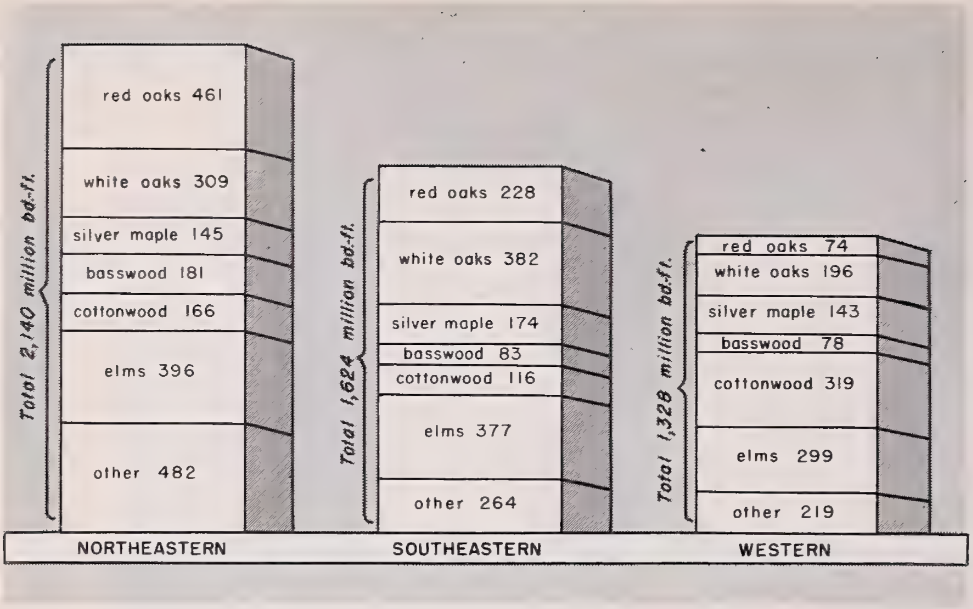


FIGURE 13.—*Sawtimber volume by species and geographic unit.*

By Stand Size

Trees of sawtimber size and quality occur in all kinds of forest stands—even on areas classed as nonstocked. Although the volume in these trees is included in the total volume statistics, it must be recognized that in most poletimber, seedling and sapling, and nonstocked areas sawtimber trees are too few to be harvested profitably. Eighty-four percent of the board-foot volume in Iowa is in sawtimber stands, but more than 800 million board-feet of sawtimber is in other stands that average less than 1,500 board-feet per acre. The stands with low volumes per acre are not attractive to timber cutters unless other products can be taken with sawlogs in the same operation.

Large sawtimber stands average 4,500 board-feet per acre and small sawtimber stands average about 3,400 board-feet. Other stand sizes average from 400 to 600 board-feet per acre. Average volumes per acre for all stand-size classes combined are greatest on bottomland sites and least on rough upland areas—they also are greatest in northeastern Iowa and least in southeastern Iowa. The average board-foot volume per acre for all commercial forest land in Iowa is 1,960 board-feet, about in the middle of the range for all the Central States.

By Log Quality

Sawlog values depend chiefly upon the percentage of better grades of factory lumber that can be cut from them. About 30 percent of the sawtimber volume in Iowa is in Grade 1 or 2 logs—logs that are most in demand by veneer mills and sawmills (7). About one-third of the volume is in Grade 3 logs that will produce low-grade factory lumber. At the bottom of the scale, more than one-third of the sawtimber volume is in logs that will not meet the present minimum specifications for factory lumber but are suitable for railroad ties, structural timbers, and some types of farm construction. Since log quality is closely correlated with diameter, much of the material that is now low grade could develop into logs of high quality if the better trees in the smaller sizes were allowed to mature.

Many factors influence the quality of the logs produced by an individual tree. Chief among these are the factors that govern the form and branching of the tree—such as site, heredity, growing space available, and species characteristics. Fire, grazing, insects and disease, in fact anything that induces unsound or blemished wood, also result in a lowering of the yield of high-grade lumber or veneer.

In Short-Boled Trees

Iowa, which is on the edge of the range of many eastern tree species, has a higher than average population of short-boled trees, that is trees whose trunks are less than 8 feet long. The volume in trees of this type is estimated to be about 420 million board-feet. The elms and white oaks are the chief species having these short logs although all species are represented to some degree. These trees are considered as culls—the volume is in addition to the 5.1 billion board-feet of sawtimber reported. However, short trunks in these trees are often sound and high in quality and could be used, in some cases, for stave bolts, veneer bolts, or special lumber products.

Cubic-Foot Volume

Growing Stock

Iowa's forest land supports about 1.4 billion cubic feet of growing stock—an average of 533 cubic feet (about 7½ cords) per acre. About one-fourth of this volume is in poletimber trees; the remainder is in the trees making up the sawtimber volume discussed in the preceding sections.

The cubic volume is distributed by species, site quality, forest type, physiographic site, stand size, and geographic region in much the same way as the board-foot volume. Some minor differences exist as a result of the smaller trees included (fig. 14).

Sawtimber stands average about 1,000 cubic feet per acre and there is very little difference between large sawtimber and small sawtimber stands. Poletimber stands average 327 cubic feet per acre and other stands usually have from 110 to 120 cubic feet. Average cubic volumes also tend to be highest on bottomland sites and lowest on rough upland areas. Forty percent of the cubic volume in soft-hardwood species is found on sites of good quality in comparison to only 15 percent of the cubic volume in hard-hardwood species.

About three-fourths of the cubic-foot volume is contained in sawtimber stands and almost 20 percent is found in poletimber stands. One-fourth of the cubic volume is in pole-size trees, one-fourth in small sawtimber-size trees, and one-half in trees 15 inches d.b.h. and larger (fig. 15). Optimum distribution of the growing-stock volume would be more nearly achieved if a greater proportion was maintained in trees from about 14 to 20 inches d.b.h. Generally trees in that diameter range increase most rapidly in volume and quality.

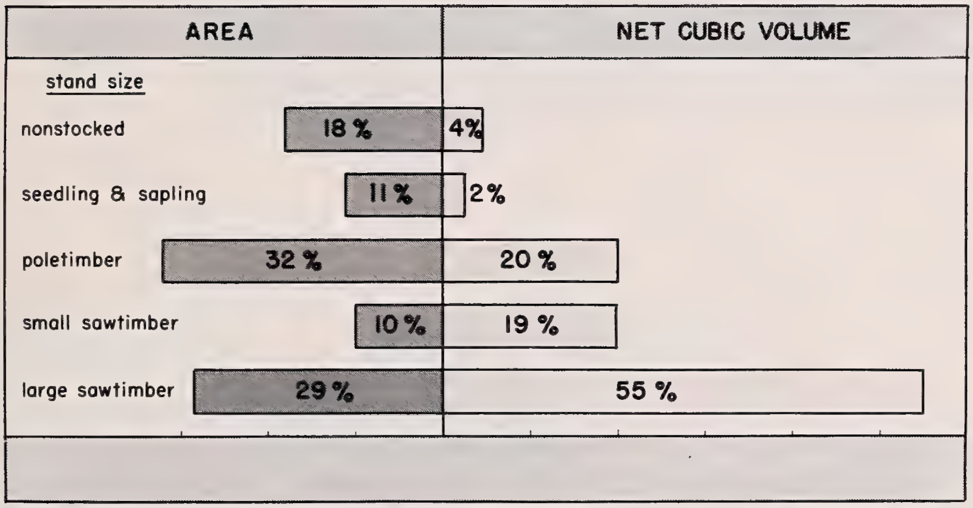


FIGURE 14.—*Cubic volume by stand size and area.*

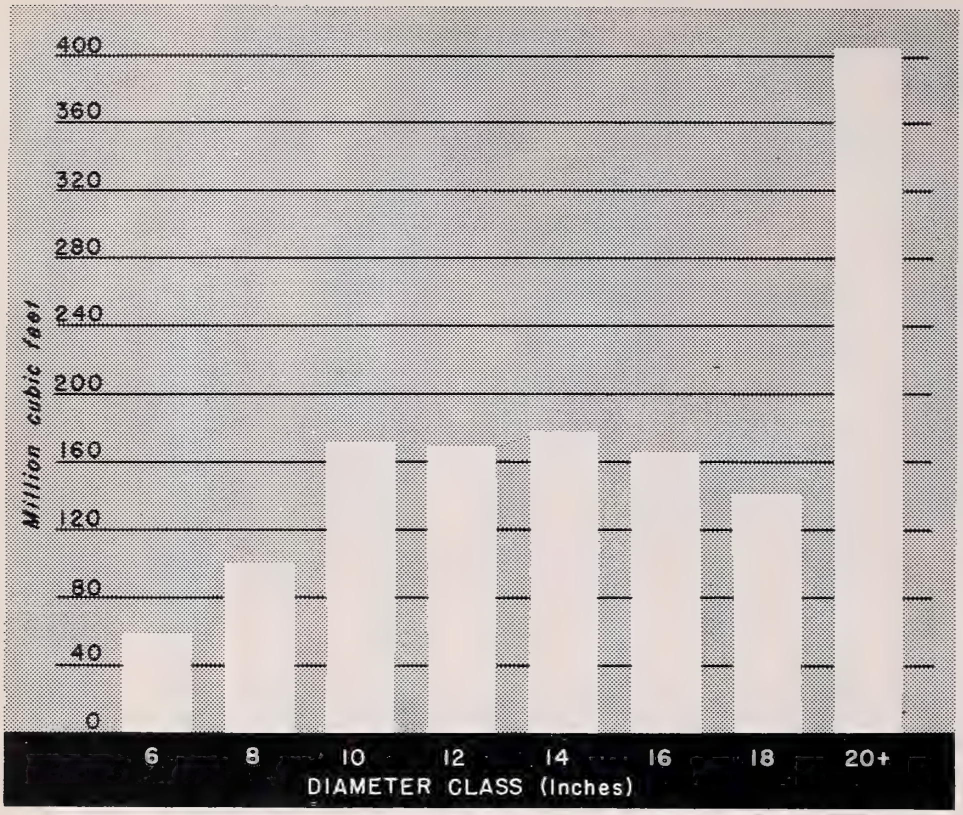
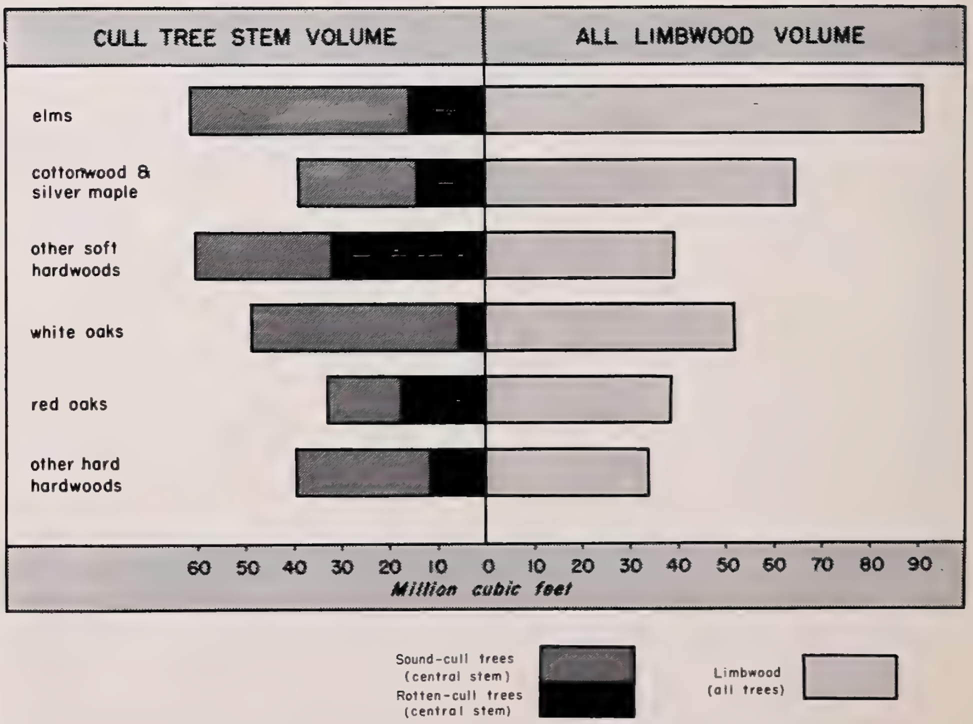


FIGURE 15. — *Cubic volume by tree-diameter class.*

FIGURE 16.—*Net cubic volume in stems of cull trees and limbs of all trees (commercial species only) by species group.*



Cull Trees and Limbs

There is more than 600 million cubic feet of sound material in cull trees and limbs on commercial forest land in Iowa—about 44 percent as much volume as is found in the growing stock. Slightly more than one-half of this net volume is in the limbs of sawtimber-size trees—both growing stock and culls (fig. 16). About one-third of the volume is in sound-cull trees and the remainder is in the sound portion of rotten-cull trees. About two-thirds of the sound volume in rotten-cull trees is in soft-hardwood species (elm, cottonwood, etc.) but only about one-half of the volume in sound-cull trees is in these species. In western Iowa, the volume in limbs and cull trees accounts for 35 percent of the total cubic volume in all trees as compared to a similar figure of 27 percent in northeast Iowa.

On the average, there are about 3 cords of this sound material per acre in addition to the volume of growing stock. Most of this volume is very low in quality and consequently, opportunities for harvesting are limited. Even when a market for this material exists, harvesting usually must be done in conjunction with a partial cutting of the growing stock in order to obtain enough volume per acre for profitable operation.

• • •

Timber Growth and Mortality

Sawtimber Growth

During 1954, sawtimber trees in Iowa added a net amount of 164 million board-feet to their volume. In addition, the total net board-foot volume was increased by 60 million board-feet of "ingrowth" as pole-size trees grew into sawtimber size. The total net board-foot growth, then, was 224 million board-feet or 4.4 percent of the inventory board-foot volume. The average net growth per acre of forest land was only 86 board-feet per year, but was much higher in sawtimber stands.

Sawlog quality is closely related to diameter because the larger logs have a greater percentage of clear or knot-free wood. The higher quality of large logs is indicated by the fact that 21 percent of the Iowa sawtimber volume in trees 20 inches d.b.h. or larger is in Grade 1 logs but only 1 percent of the volume in 12- to 14-inch trees is Grade 1. With improved management, the percentage of Grade 1 material in the larger trees will undoubtedly increase.

Growing-Stock Growth

The net growth of the growing stock in 1954 was 68 million cubic feet. More than 95 percent of this increase was due to growth of growing-stock trees—the remaining increase came from the ingrowth of saplings that reached 5.0 inches d.b.h. The average forest acre in Iowa produced only 26 cubic feet of net growth in 1954. Well-managed and well-stocked stands on average sites in Iowa are capable of growing at from 2 to 3 times that rate. Vigorous bottomland stands may grow more than 1½ cords per acre per year.

In most cases, diameter growth is directly correlated with tree diameter—that is large trees grow in diameter faster than small trees. However, the smaller trees account for a greater percentage of the volume growth because there are so many more of them. Growth rates also vary according to species, topographic site, stocking, and individual tree characteristics such as crown development and vigor (fig. 17).

Losses in growth result from wildfire, disease, insects, grazing, and so on. It is difficult if not impossible to evaluate these losses. However, it is possible to estimate losses in growth of trees that died and those that deteriorated to a point below the minimum standards of merchantability during a certain period of time. It is probable that growth losses on living, still merchantable trees are much greater than losses on trees that die or become culls (fig. 18).

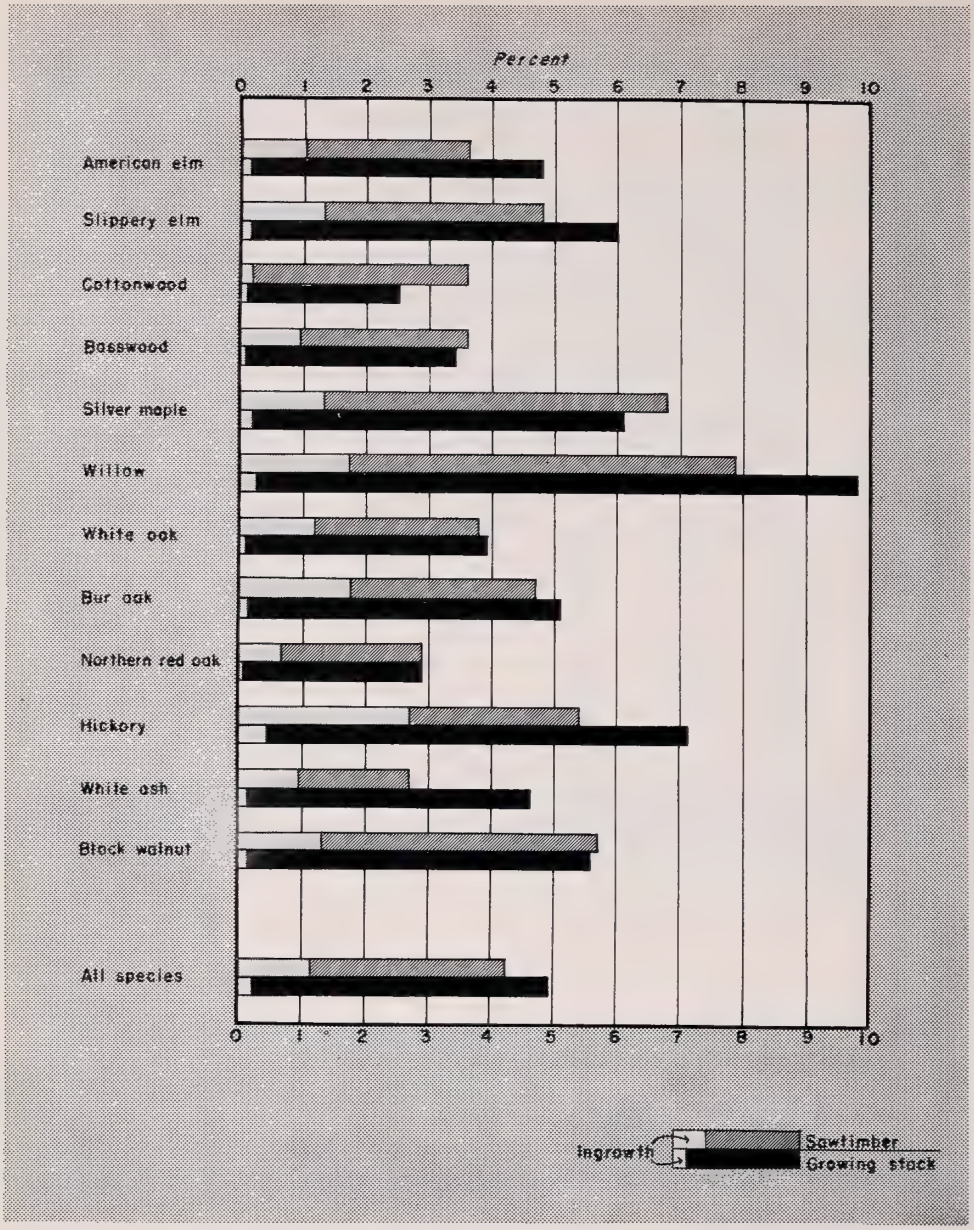


FIGURE 17. — *Average annual net growth rates of sawtimber and growing stock.*

Mortality

Twenty-seven million board-feet of sawtimber was lost in 1954 from natural causes—roughly equivalent to half the ingrowth volume gained. Expressed in cubic feet, the mortality losses amounted to 8.2 million cubic feet—about 0.6 percent of the growing-stock volume. Almost three-fourths of the cubic volume loss from mortality was cottonwood, elm, and oak.

Many causes of timber mortality have been noted in Iowa. Some of the more important are disease, fire, overtopping, windthrow, insects and animals (fig. 19). Losses from most of these can be reduced or eliminated as forests are brought under management. In managed forests weak or dying trees are salvaged and the areas are protected from grazing and fire. Diseases such as the oak wilt and Dutch elm diseases are present in the State but currently are not causing serious trouble.

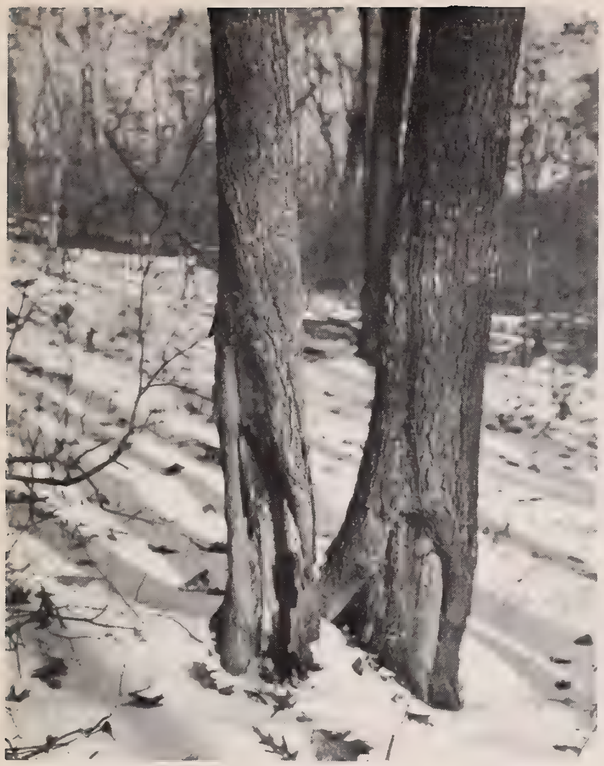


FIGURE 18.—*Defect developing from fire scars.*

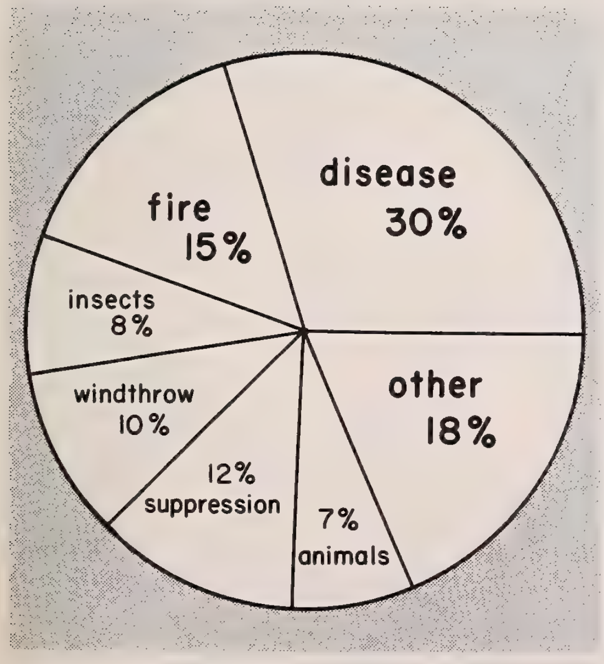


FIGURE 19.—*Causes of mortality by percent of cubic volume killed.*

Effects of Grazing

Twenty-seven percent of all forest land in Iowa is so heavily grazed that no young trees are present to take over the sites when the trees there now are cut or die (fig. 20). If these areas are to be maintained in forest—they will have to be protected from grazing so that the stand will regenerate naturally, or they will have to be planted and then protected.

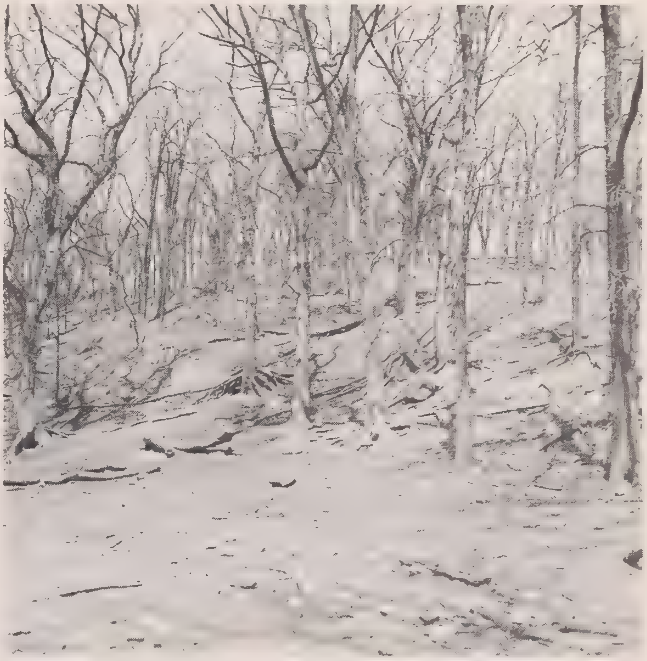


FIGURE 20.—*Severe erosion on heavily grazed woodlot in Boone County.*

Eighty percent of the forest land is grazed to some degree. Although most of the area will remain in forest, the stocking and quality of trees are adversely affected by grazing and the resultant losses in growth from these areas are enormous in the State as a whole. Livestock raising is important on Iowa farms. The cattle get some forage from woodland pasture but studies have shown the forage value to be small compared to that of improved bluegrass pasture (5). The relative profits obtainable from grazing and timber growing on timber sites have not been established. It is evident, however, that if quality hardwood timber is to be the main crop livestock should be kept off the land.

Timber Cutting

Timber cutting reduced the growing stock in the forests of Iowa by an estimated 22 million cubic feet in 1953—about 1.6 percent of the cubic-volume inventory. Included in the timber cut was 2 percent of the standing sawtimber or about 102.5 million board-feet. These timber-cut figures include only the volumes cut from commercial forest land and do not include volumes produced from noncommercial species, dead or cull trees, or limbwood. Merchantable material lost in logging and milling is included as well as the volume of wood that actually is developed into a finished product.

About 5 percent of the commercial forest area in Iowa is cut over annually; cutting is distributed fairly evenly throughout the State. Some areas are clear-cut, a few are cut to leave a more thrifty stand, but the majority are "high-graded"—only the best trees are harvested. In addition, some timber is removed from noncommercial forest land such as narrow wooded strips. Salvage of dead trees, cull trees, and limbwood produces significant volumes of wood products. No accurate estimate of these volumes is available.

An estimated 4 percent of the sawtimber volume cut was left in the woods as logging residue. Some of this volume could have been saved by better felling and bucking practices. However, some losses from breakage and other causes are unavoidable.

About half the timber cut came from the forests in the northeastern section and almost 40 percent came from the southeast. Western Iowa contributed only about 10 percent of the timber cut. General observations indicate that cutting on noncommercial forest land was most prevalent in western Iowa. Twice as much volume was cut from poletimber trees in southeast Iowa than anywhere else. Northeast Iowa, however, accounted for almost two-thirds of the timber cut from trees 19 inches d.b.h. or larger. These geographical variations in timber cutting are closely related to characteristics of the inventory volume discussed previously, and to available markets.

About three-fourths of the timber cut in Iowa comes from oak, cottonwood, and elm trees according to several independent studies in recent years. Maple, black walnut, and basswood were the next three most important species in terms of the volume of timber cut (fig. 21). The proportion of volume cut from poletimber trees did not vary significantly by species. The distribution of the species throughout the State, of course, dictates to some extent what species are cut.

Timber cutting tends to be concentrated on the larger diameter trees. For example, although only about half of the inventory volume is in trees 15.0 inches d.b.h. and larger, almost two-thirds of the timber cut came from trees of that size.

Species and quality of timber to be cut have a strong influence upon the logging possibilities on specific tracts. Veneer-log buyers, for example, are willing to harvest a much lower volume per acre than buyers of less valuable products. Generally, lower stumpage values make necessary a greater concentration of merchantable volume to attract timber operators.

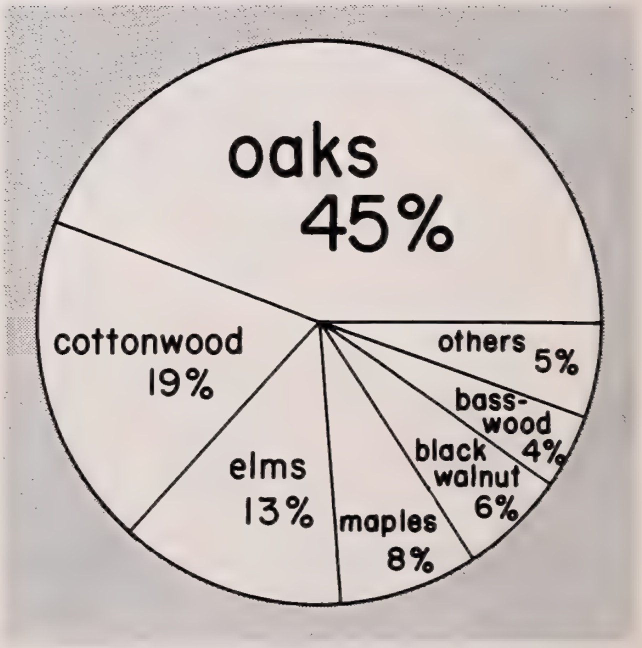


Figure 21.—*Species of timber cut.*

Trends in Timber Volume

Both the board-foot and cubic-foot volumes in the forests of Iowa are increasing steadily. The net volume of sawtimber growth was more than twice the volume of sawtimber harvested. The net board-foot increase, after deducting timber harvested and mortality, amounted to 2.4 percent of the standing sawtimber volume—an average of 47 board-feet per acre per year. However, the characteristics of the forests and of timber harvesting lead to wide variations between specific areas of the State.

The increase in volume is concentrated to a large degree on trees less than 15 inches in diameter. This, of course, is because the average diameter of trees harvested is significantly greater than the average diameter of all trees. In fact, slightly more volume was harvested from trees 20 inches d.b.h. and larger than was added to trees of that group by growth (fig. 22).

It is likely that, if timber harvesting practices remain fairly constant and no catastrophic losses occur, there will be a continuing buildup of the sawtimber volume in Iowa during at least the next 10 to 15 years. It is likely also that the total volume of high-quality sawtimber will gradually increase in that period. On the other hand, it is clear that the percentage of volume in the most desirable species, such as red oak and black walnut, will decrease steadily because these species are more sought after by the loggers. Also, a larger area will be occupied by cull or defective trees that are repeatedly passed over in logging operations.

Renewed interest in forestry, coupled with the various programs of assistance and guidance for forest land owners, may result in continuing improvement in the forest situation. Much of the forests of Iowa are in formative stages where forest management can have a measurable effect upon stocking, growth, structure, and composition in a relatively short period.

Cutting practices could change significantly in a few years and alter the outlook for timber volume in the future. The increased use of hardwood species for pulp, for example, could have a very strong influence upon the forests within hauling distance of pulpwood-using plants. The development of pulpwood markets, however, is still too recent to give firm indications of what their longtime influence will be.

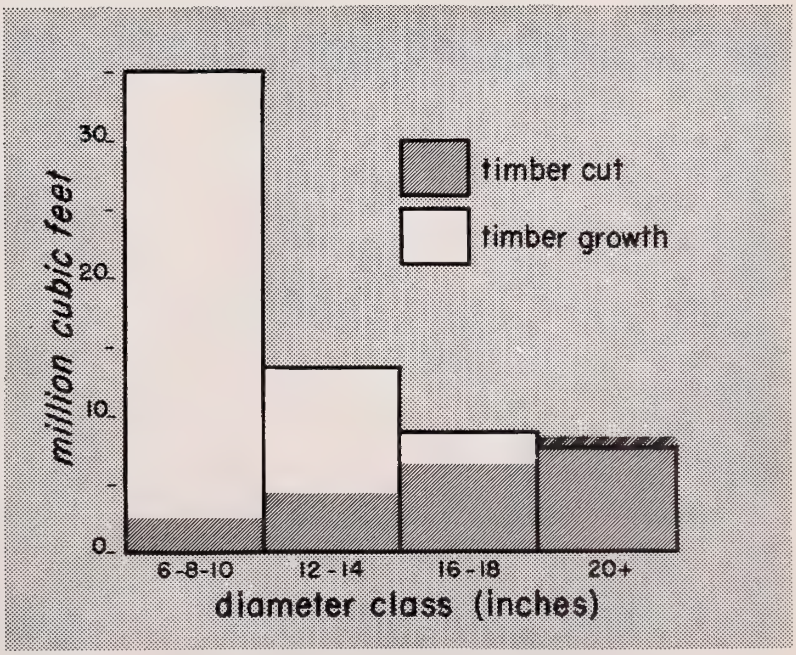


FIGURE 22.—*Comparison of annual growth and cut.*

Wood Use and Manufacture

The forests of Iowa contribute only about one-third of the volume of wood used in manufacture in the State each year. Softwoods make up more than 80 percent of the lumber volume used in the State and nearly all of the softwood volume is imported from western states. About 80 percent of the imported hardwood volume comes from the southern states. Most of the pulpwood, fuelwood, and miscellaneous forest products used in Iowa originate within the State.

The Lumber Industry

Sawmills have been active in Iowa almost since the first settlers arrived. Pine logs from Minnesota and Wisconsin were rafted down the Mississippi River and hauled ashore to sawmills at river towns like Dubuque and Clinton. Most of the lumber used in building the first prairie towns came from these mills and was sawed from these imported logs.

Today Iowa is dotted with sawmills from the Mississippi to the Missouri River. A recent listing shows a total of more than 1,000 (fig. 23) (2). Most of these mills are small and many operate intermittently throughout the year (fig. 24). About 96 percent of the mills show an individual production of less than 200,000 board-feet per year—about 2 months' work for a 3-to-5-man crew. Some of the smaller ones are operated for convenience of the owner, or for custom sawing, and many are portable.

Lumber production in Iowa reached its peak around 1890 when more than 600 million board-feet were produced annually. It dropped rapidly in the next 30-year period, reaching a low annual production of from 10 to 15 million board-feet at the end of the first World War. Since then there has been a gradual, long-term, upward trend. Studies indicate that about 65 million board-feet of lumber were produced in 1953 from logs cut in Iowa forests (fig. 25).

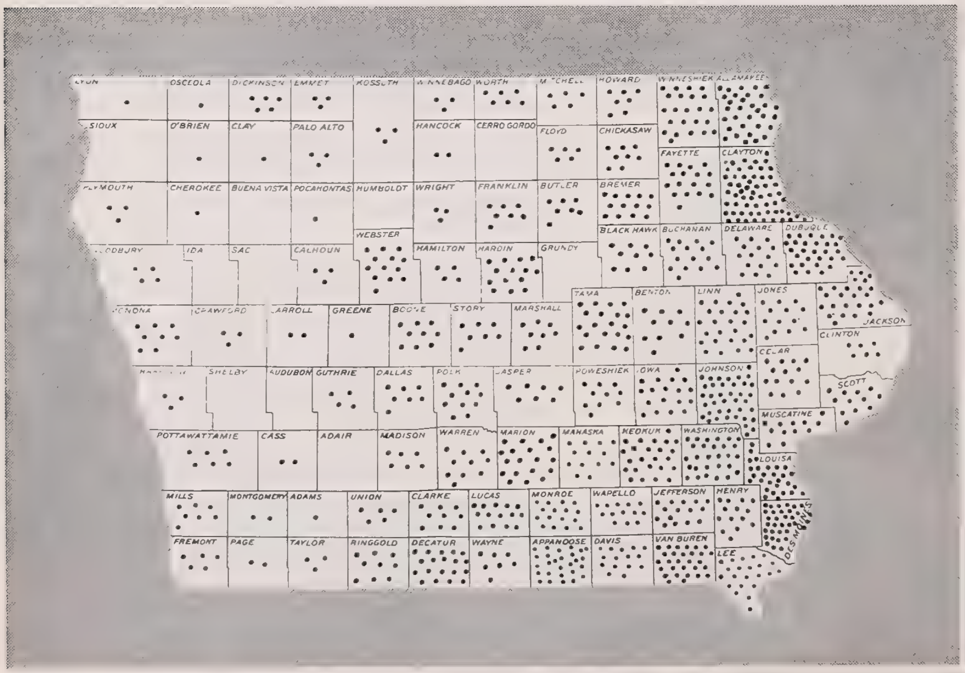


FIGURE 23. — *Distribution of Iowa sawmills, 1952.*

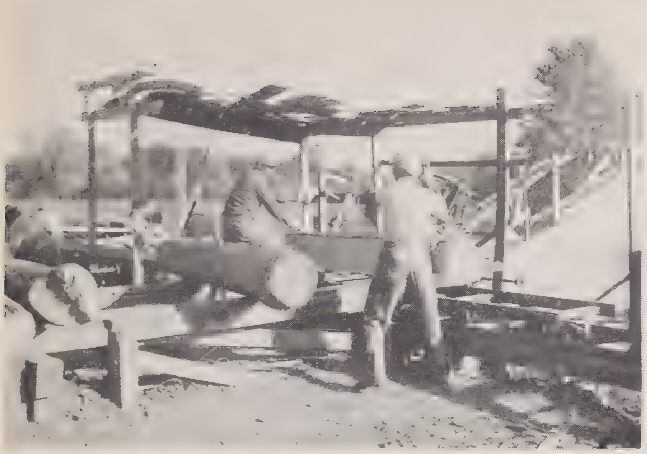


FIGURE 24.—*Small sawmill in Iowa.*

About two-thirds of the annual cut of sawtimber in Iowa goes into sawlogs for the production of lumber and crossties. Except for fuelwood, which takes 20 percent of the sawtimber cut, each of the other uses for sawtimber takes less than 5 percent of the cut.

The sawlogs are worth about 2¼ million dollars delivered at the mills; in the standing trees, they are worth about 1 million dollars; the rough lumber and ties sawed from these logs are worth from 4 to 5 million dollars (fig. 26). There is, of course, a wide range in the value making up these averages; species, quality, economic factors, and other influences determine these values for each particular case. Most of the lumber produced in Iowa is sold rough and green for local use on farms or in the manufacture of wood products that do not require clear lumber (fig. 27). Over 600 wood-using industries or buyers of wood products, excluding sawmills, were reported to be located in Iowa in 1952 (3).

Oak lumber accounted for about 40 percent of the total produced in Iowa in 1953. Another 45 percent was made up of cottonwood, elm, and maple (fig. 28). The quality and size of logs cut for lumber have not been accurately determined. However, experience in nearby states indicates that the average quality of the logs sawed for lumber is much higher than for those remaining in the standing timber.

The Veneer Industry

The second most important timber market for the hardwoods of Iowa is the veneer industry. In 1953 about 5 percent of the annual cut of sawtimber-size material was consumed at veneer mills. Most of this volume is exported—in fact, according to a survey of the veneer industry in 1956, three-fourths of the volume of veneer logs cut in Iowa was shipped to mills outside the State (9). Almost all of the veneer-log harvest is used to produce commercial or face veneer although a small amount is used in container manufacture (fig. 29).

Veneer-log buyers search continually for high-quality black walnut trees or logs. Frequently they purchase individual trees in order to obtain one or two prime logs, but get most of their supply from sawmill operators or sawlog buyers that hold veneer-quality logs for resale. Prices paid for top-quality-veneer logs may be much higher than those paid for the same volume of ordinary sawlogs, but top quality is very hard to judge in the standing tree.

About three-fourths of the veneer-log harvest is cut from black walnut, oak, and maple trees (fig. 30).

The supply of veneer-quality logs in Iowa may be expected to diminish gradually in the next 10 to 15 years. The young stands building up today do not contain as many black walnut trees as did earlier forests, and stand conditions generally are not favorable for the development of trees of high quality. If better stocking and improved harvesting practices become more universal in Iowa this trend could be reversed. Also, new techniques of manufacture and shifts in consumer preference may result in a veneer-log market for more species and with less rigid specifications.

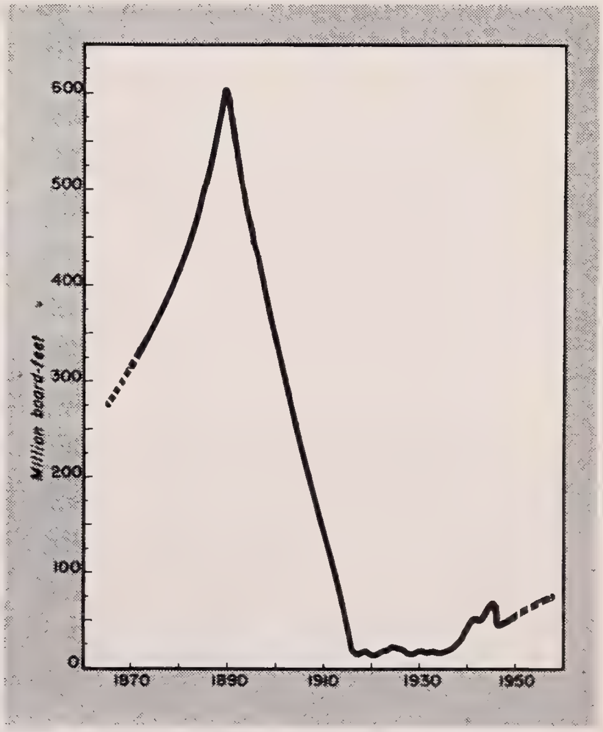


FIGURE 25.—*Trends in Iowa lumber production.*

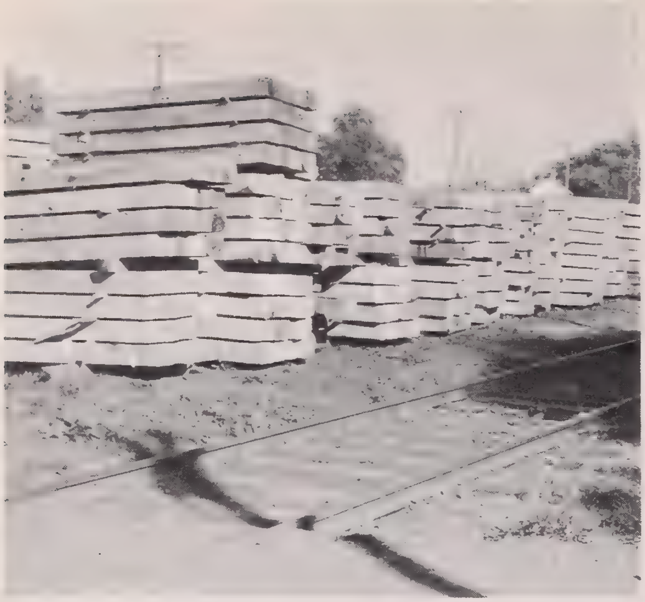


FIGURE 26. — *Cross-ties from Iowa timber.*

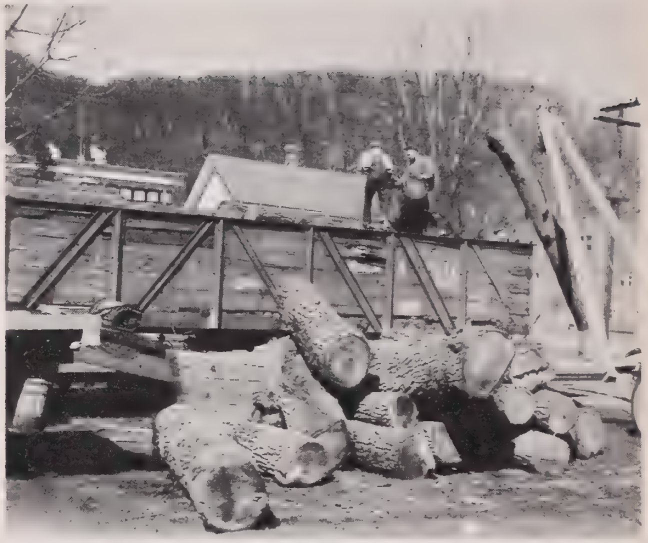


FIGURE 28.—*Cottonwood logs — Pottawattamie County.*

The Pulpwood Industry

The nationwide increase in the use of hardwood species for pulpwood has been reflected in Iowa. Recent canvasses of pulpwood-using plants in the north central region indicate that the harvest of pulpwood in Iowa has increased to six times the 3,200 cords reported in 1953 (**8**). New pulping facilities established at Dubuque and Fort Madison have spurred this increase. Soft-hardwoods, such as cottonwood, willow, sycamore, and soft maple, are most in demand for pulpwood, although oaks and other hard species are accepted at some plants.

FIGURE 27.—*Farm building made from native lumber.*

Although the market for pulpwood is important mainly within hauling distances of pulpwood-using plants, it is expected that this market will become more important in future years. It is possible to cut pulpwood from material not suitable for most other forest products. Much of the sound volume in cull trees, limbs, and small poletimber trees can be used for pulping. This makes possible forest management practices usually too expensive to put into effect in other areas.

Naturally, pulpwood operators would prefer to harvest straight, clean poletimber of fairly large diameter in order to minimize logging costs. An adjustment in stumpage price, a bonus paid at the plant, or some other inducement is required to move significant quantities of pulpwood cut from cull trees or limbs of trees harvested for sawlogs.

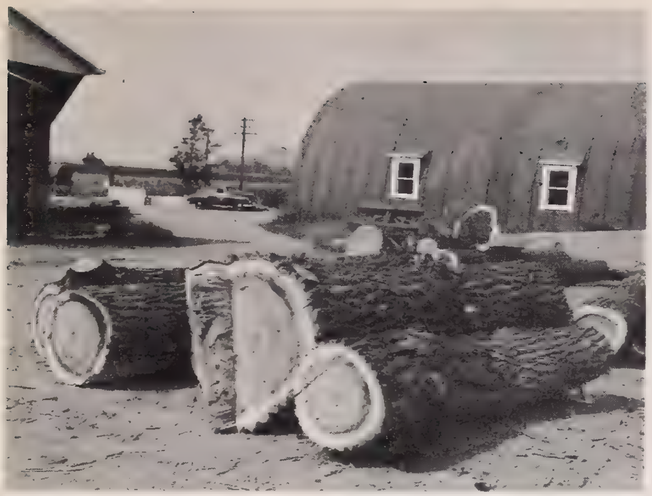


FIGURE 29.—*Black walnut veneer logs — Clayton County, Iowa.*

Other Uses for Iowa Timber

Several other uses for wood from Iowa's forests are worthy of mention although determination of the volumes used is more difficult and larger errors of estimation are unavoidable.

An estimated 2.4 million fence posts were harvested in Iowa in 1953, but only about half were cut from the growing-stock volume. Dead and cull trees and trees on nonforest land made up the remaining volume of fence posts. Oak, elm, and miscellaneous species are cut for fence posts. Some are treated with preservatives to extend their useful life. Some farmers alternate wooden fence posts with metal ones to provide added strength. When markets exist, fence-post cutting is a good way to improve stand conditions if trees are selected carefully (fig. 31).

In southeast Iowa a small amount of timber is cut for cooperage. Small, portable stave mills provide a temporary local market for high-quality oak logs. Although the impact of their operations on the total resource of Iowa is small, stave mills do represent an additional outlet for the better quality timber in the larger diameter classes.

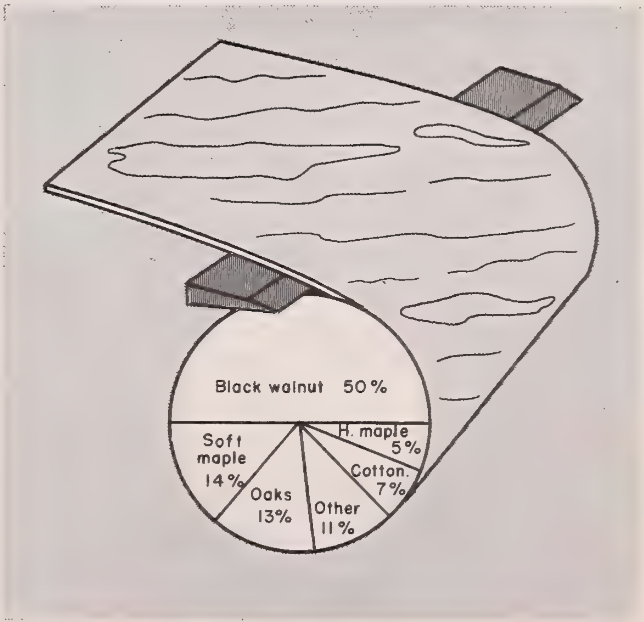
An estimated 383 thousand cords of fuelwood were produced in Iowa in 1953 but only 31 percent of that amount was cut from the growing stock. Still, 20 million board-feet of merchantable sawtimber went into fuelwood. Twenty-seven percent of all fuelwood harvested came from dead trees; 20 percent was cut from cull trees and limbs, and 16 percent was cut on nonforest land. Oak and elm accounted for about half of the fuelwood harvested from the growing stock. Fuelwood provides an outlet for low-quality material that usually has no other value. Consequently, the harvesting of fuelwood can also be tied in effectively with stand improvement work.

Wood Used in Manufacturing

Wood is a basic raw material in hundreds of manufacturing plants in Iowa producing scores of different types of wood products. The 1954 Census of Manufacturers includes major wood-using industries in a "Lumber and Wood Products" category (*11*). This group includes large sawmills, planing mills, veneer mills, millwork plants, wooden container plants, miscellaneous wood product manufacturers, and other related establishments. In Iowa, the most important users of wood for manufacture are the millwork plants and the container industries.

Plants in the "Lumber and Wood Products" category employed 16,586 people or 10.3 percent of all employees in Iowa in 1954. This same group also accounted for 8.6 percent of the State's payroll—about 55.2 million dollars. The value added by manufacture, that is the value of shipments minus the cost of materials, fuels, etc., amounted to 81.4 million dollars.

FIGURE 30.—*Species of veneer logs harvested—1956.*



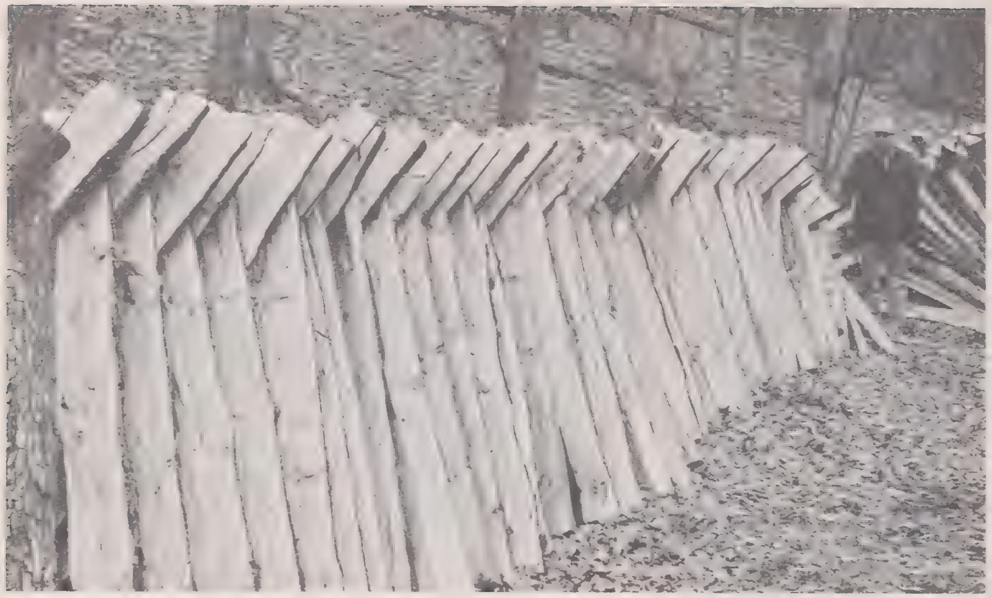


FIGURE 31. — *Fence posts from trees removed in thinning — Amana Experimental Forest.*

Hundreds of other manufacturers in Iowa use wood as a raw material but are not included in the basic "Lumber and Wood Products" group. They use wood either in their product or in shipping or in both. An indication of the significance of these establishments in the overall wood-use picture is afforded by a 1948 analysis of wood use in manufacture in the United States (6). At that time, for the entire United States, 46 percent of the total volume of wood used in manufacture was consumed at such plants. Examples of the more important types of industries in this group are: Furniture, partitions, shelving, railroad car manufacture and repair, mortician's goods, and refrigerator shipping. It is apparent that the use of wood plays an even more vital role in the economy of Iowa than is indicated by the preceding paragraph.

A recent study in Iowa (3) points out why most wood-using industries in Iowa must import lumber. They have found through experience that Iowa lumber is less satisfactory because it is not surfaced or dried sufficiently, is not accurately manufactured, or is not available in the species, quantities, or grades required. If more and better timber is to be produced by the forests of Iowa, it is evident that the manufacture and marketing of lumber from that timber must be improved also.

Major Significance of Survey Findings

Although Iowa is primarily an agricultural State, its industries require much more timber each year than it produces on forest land within the State. In Iowa, as in the Nation, a continuing expansion of the population, coupled with industrial growth, may be expected to increase timber requirements greatly during the coming years. The recent Timber Resource Review (TRR) showed evidence of future demand for forest products exceeding the amount that could be produced at present levels of forest practice (*12*).

However, timber production is by no means the only use and value of Iowa's forests. Costly experience in the past has proved that forest cover must be maintained on some areas in the State to prevent soil erosion. Another important value of the forest acres, although most difficult to measure by monetary standards, is their use for recreation. The rising population, together with a continuing increase in leisure time and disposable income, points to an ever-increasing use of the forests for this purpose.

The current excess of total timber growth over cut is a favorable situation in which to develop more satisfactory stand structure and to stimulate growth. However, it is not at all an automatic improvement merely because the total timber volume increases annually (fig. 32). The average forest acre in Iowa now has about 39 square feet of basal area (basal area—a convenient measure of stocking—is the sum of the cross-sectional area of tree stems measured 4½ feet above ground level). As a very general average, well-stocked stands in Iowa should have something like 95 square feet of basal area per acre (*1*). Therefore, the average stocking needs to be more than doubled to provide a base for maximum growth. Economics may dictate greater or less stocking for individual stands.

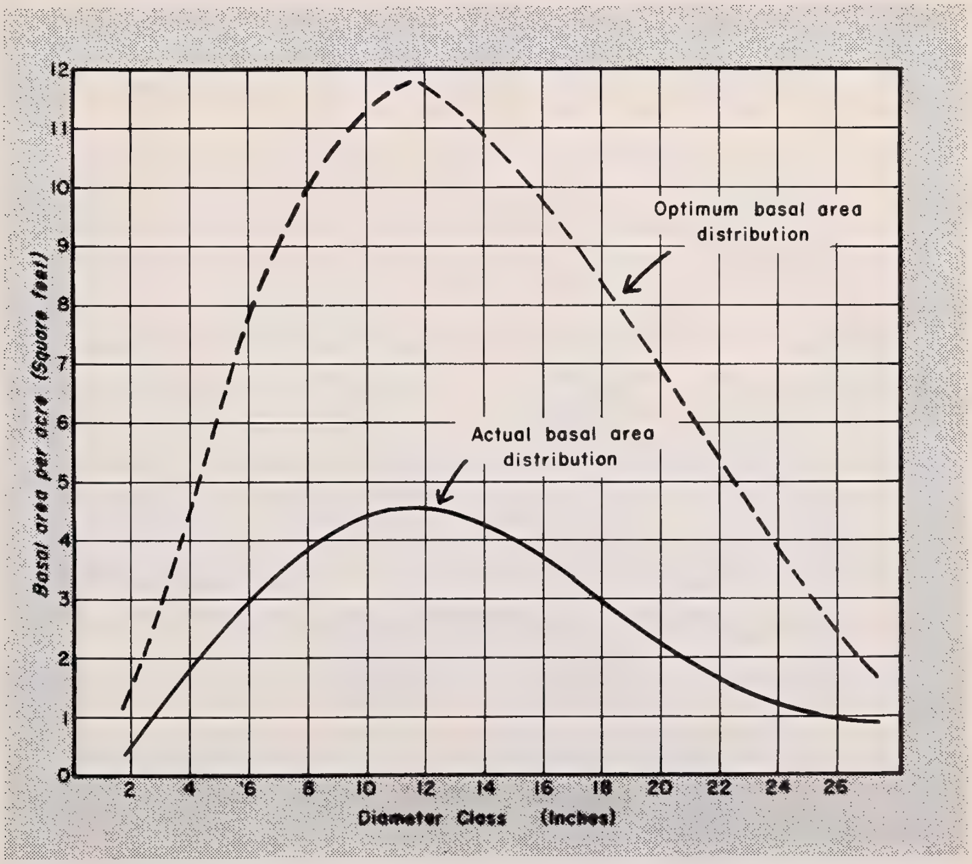


FIGURE 32.—*Optimum and actual basal area per acre by diameter class.*

With present cutting practices, any increase in average basal area per acre will occur in trees smaller than 20 inches in diameter. Board-foot growth of larger trees is held down by concentration of cutting in the larger diameter classes. Commercial clearcutting, despite the resultant stand deterioration, is an established practice used by loggers and woodland owners primarily interested in immediate financial returns. The forests of Iowa will benefit most at this time if the indiscriminate cutting common today is discouraged as much as possible. In time, if protected from destructive cutting, most stands will gradually build up until they are well enough stocked to support periodic partial cuts.

Protection of the forests from fire, insects, and disease is another way that the productivity and overall values of the forests can be increased significantly. The best timber-cutting practices are futile when a stand is periodically or continuously damaged by destructive agents. When wood-rotting fungi become established in a tree, through fire scars, insect damage, or other causes, the tree becomes a candidate for mortality or salvage. Uncontrolled fires continue to be a threat to the forests in eastern Iowa, though only 1,119 acres of forest land were burned over in Iowa in 1954.

Although some idle land will slowly become forested if left undisturbed, establishment of a productive forest on bare land is best accomplished by planting (fig. 33). Approximately 46,000 acres of forest plantings have been undertaken in Iowa to date, but only about 14,000 acres of acceptable plantations are on commercial forest land (*12*). Many plantings are of less than 1 acre in size and thus do not qualify as commercial forest land.

Poorly stocked seedling and sapling stands can be improved by planting trees in the openings so that all of the growing space is utilized. Young stands of inferior species can often be improved by underplanting trees with more desirable characteristics. The State forest nursery at Ames, operated by the State Conservation Commission, produced 441,000 trees in 1955. Three commercial forest tree nurseries are also located in Iowa.

Good forest management is handicapped in many cases by inadequate markets or a lack of information concerning marketing methods, prices, or the location of timber buyers. In general, good-quality timber finds a ready market if there is enough volume to interest a buyer. Marketing lower grade material, however, requires an intensive effort by a well-informed seller or agent and even then may be unsuccessful. A continuing campaign to improve products and to acquaint timber owners with basic marketing practices, should do much to increase interest in and returns from their forest land.

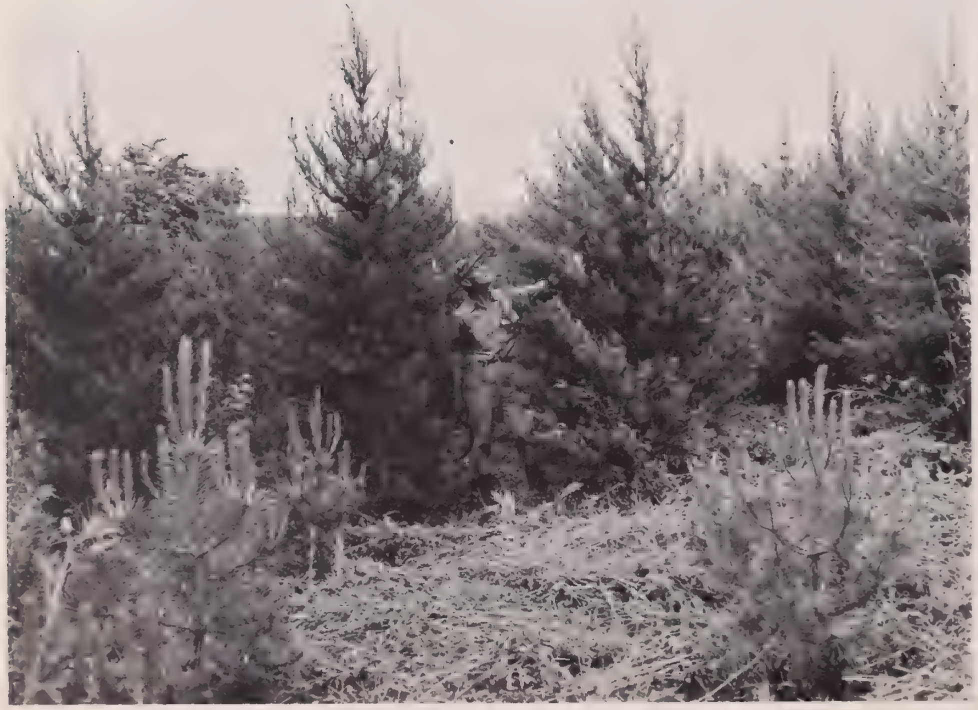


FIGURE 33. — *Seven-year-old jack pine planting — Monona County.*

Forest owners often can increase income from timber harvesting by selecting, cutting, and transporting logs to a market or shipping point after a sale is arranged. Here too, much educational work is needed to promote good harvesting practices. Log cutting alone can significantly influence the financial returns of a harvesting operation. Farmers frequently have the necessary equipment and some can provide enough labor to undertake their own logging.

Several agencies in Iowa have programs designed to assist woodland owners and to stimulate application of forestry principles and practices. The Division of Lands and Waters of the Iowa Conservation Commission has an active forestry organization. Six farm-forestry districts have been set up in the forested areas of the State under the Cooperative Forest Management Act of 1950. Foresters working in these districts assist owners in appraising and marketing timber and also advise and aid farmers in managing their woodlands.

The Agricultural Conservation Program of the United States Department of Agriculture also actively aids woodland owners. Upon approval of county Agricultural Stabilization and Conservation Committees the Federal Government will share in the cost of planting trees, improving stands of timber, and protecting woodland from grazing. In 1956 this assistance to Iowa woodland owners amounted to about $12,000—about 97 percent of this amount was cost-sharing in tree planting. The Soil Conservation Service includes advice to farm woodland owners as a part of farm-planning activities.

Private consulting foresters also assist woodland owners in forest management or timber marketing. They sometimes serve as the agent of absentee owners or manage industrial forest tracts.

An Extension Forester maintains an office at the Iowa State College of Agriculture at Ames. His work, primarily on a statewide basis, is intended to improve the management of forests in the State through demonstration and education. County Extension Directors carry on this work at the local level.

Research in forestry and related fields is conducted by several organizations in Iowa. The Iowa Agricultural Experiment Station at Iowa State College, conducts investigations in all aspects of agriculture including forestry. The Central States Forest Experiment Station maintains a research center at Ames in cooperation with the college and an experimental forest in cooperation with the Amana Society.

Almost all of the agencies concerned with forestry activities in one way or another help to bring better forestry practices to the attention of woodland owners by demonstrations, field days, tours, meetings, motion pictures, and printed materials.

Even under the best possible treatment many years will be required before the bulk of forest land in the State can approach its potential productivity. Continuing progress in the establishment and improvement of forest management practices together with improved marketing opportunities will be necessary if the forests of Iowa are to contribute their full share to the State's economy.

Literature Cited

(1) Campbell, R. B.
1955. Manage your farm woodland for greater profit. Agr. Ext. Serv., Iowa State College. Pamphlet 217, 8 pp. illus.

(2) Getty, R. E.
1953. The sawmills of Iowa. Agr. Ext. Serv., Iowa State Col., Pamphlet F56, 24 pp. illus.

(3) Getty, R. E.
1953. The wood-using industries of Iowa. Agr. Ext. Serv., Iowa State Col., Pamphlet F57, 16 pp.

(4) Hartong, A. L. and Moessner, K. E.
1956. Wooded strips in Iowa. Cent. States Forest Expt. Sta. Forest Survey Release 21, 15 pp. illus.

(5) Iowa Agricultural Resources Conservation Group
1953. Iowa agricultural resources conservation program. Unpublished report. 98 pp.

(6) Merrick, G. D.
1951. Wood used in manufacture—1948. U. S. Forest Service Forest Resource Report 2. 66 pp.

(7) Morgan, J. T.
1955. Log grades of Iowa timber. Lake States Forest Expt. Sta. Technical Note 443. 2 pp.

(8) Thornton, Philip L.
1957. Pulpwood production continues to increase in the Central States. Central States Forest Experiment Station. Sta. Note 104. 2 pp.

(9) Thornton, Philip L.
1957. Veneer-log production and consumption in the Central States—1956. Cent. States Forest Expt. Sta. Sta. Note 112. 2 pp.

(10) U. S. Bureau of the Census
1956. U. S. Census of Agriculture; 1954. Vol. 1—part 9. 258 pp.

(11) U. S. Bureau of the Census
1956. U. S. Census of manufacturers: 1954. State Bul. MC-114; Iowa. 12 pp.

(12) U. S. Forest Service
1958. Timber Resources for America's Future. Forest Resource Report 14. 713 pp. illus.

(13) Walker, R. H., and Brown, P. E.
1936. Soil erosion in Iowa, Agr. Exp. Sta., Iowa State Col. Special Report 2. 47 pp. illus.

Appendix

FOREST SURVEY PROCEDURE

The field inventory of the forests of Iowa was made during the period November 1953 to August 1954. This task involved office study of aerial photographs and field examination and measurement of randomly selected forest and non-forest plots.

Area Estimates

The percentage of forest land was obtained by placing a transparent sheet marked with uniformly spaced dots over aerial photographs and counting the number of dots falling on forest and nonforest areas. The percentage of forest dots in a county, multiplied by the total county area gave a preliminary estimate of the forest area. This was later adjusted after field examination of selected plots showed how many plots had changed from forest to nonforest and vice versa since the date of aerial photography.

Systematically selected dots falling on forest land were marked on the photographs. The acre surrounding each marked dot was examined stereoscopically and was classified by stand-size class according to height, crown width, and number of trees on the plot.

Plots to be examined in the field were randomly drawn but the selection was weighed—more of the larger stand-size classes were selected than the smaller. Crews of two men located these points on the ground and established a 1/5-acre circular plot at each point. Such data as tree species, size, log quality, cull, and growth of trees were recorded.

The following tabulation gives the number of dots and plots examined for the State as a whole.

Number of photo dots counted for forest-area determination	271,224
Number of plots stereoscopically examined on photos	3,259
Number of forest plots field examined	751

Volume Estimates

Sawtimber volume—The gross board-foot and cubic-foot volume tables used in the Iowa survey were based upon the Mesavage-Girard form-class tables. Average form classes were computed from measurements obtained from 707 trees selected randomly on the field plots. Commercial species were segregated into 6 groups on the basis of similar form-class characteristics and separate gross cubic-foot and board-foot volume tables were prepared for each group. The average form class of all trees measured was 77.

The upper stem volume of all sawtimber trees was computed from field estimates made for each sawtimber sample tree. This volume, expressed in cubic feet, includes the portion of the bole or central stem between the merchantable top and a minimum top diameter of 4.0 inches inside bark. One net table was used for all hardwoods since analysis of data showed almost no difference among species or groups of species.

The volume in limbs of hardwood sawtimber trees was also computed from field estimates made for each sample tree. Limbwood is the sound material in tops and limbs not included in the sawtimber or upper stem portions of the tree. The minimum diameter inside bark is 4.0 inches, also. Here again, one net table for all hardwood species was found to be sufficient.

The merchantable height and diameter at breast height were measured on 275 randomly selected poletimber sample trees on the field plots. Analysis of these data resulted in separating all hardwood species into either a "high" volume group or a "low" volume group. Net cubic volume tables were prepared for these groups of species having similar diameter-height relationships.

Eastern redcedar data were inadequate from the Iowa field work so a volume table based on data collected in other Central States was used for this species.

Cull Estimates

Allowance for defect in merchantable sawtimber trees was determined by estimating sound and rotten board-foot cull in 1,474 sample trees. Curves of cull percent over diameter classes were prepared, species with similar cull percents were grouped, and a weighted cull percent was established for each species group and diameter class. A few species—white oaks and hickory—made up a "low-cull" group and the other species were included in a "high-cull" group. Cull percent deductions applied to the gross board-foot volume tables ranged from 2.9 to 9.0 percent depending upon species and diameter-class.

The cubic-foot cull in sawtimber trees was estimated in a similar manner except that only rotten or unsound defects were considered. These deductions ranged from 0.6 to 4.0 percent when applied to the gross cubic-foot volume tables.

The average cubic-foot deduction for unsound defects in poletimber sample trees was less than 0.5 percent. Poletimber growing stock only includes trees expected to be merchantable as sawtimber at some future date.

Estimates of the cubic volume of sound material in cull trees were also computed from sample tree data taken on the field plots. Cull trees were classified into 4 distinct groups depending upon the characteristics that eliminated the tree from the growing stock volume. Sample trees in each of these groups indicated the volume deduction to be applied to the gross volume table used; these deductions ranged from 0 to 80 percent. Separate volume tables for upper stem volumes (in this case the volume between 8.0 inches and 4.0 inches d.i.b. in the central stem and limbwood volumes) were prepared for cull trees.

Growth Estimates

Increment cores were taken from 1,854 sample trees well distributed throughout the range of species and diameter classes encountered. The average 10-year diameter growth inside bark was computed by species and 2-inch d.b.h. class. A curve of diameter growth over average tree diameters was prepared and, from bark thickness studies, an allowance was made for bark increase in the 10-year period. This was added to the curve value of diameter growth indicated for each 2-inch d.b.h. class. The average volume of trees in the present 2-inch class was established and, from the growth curves, the future 10-year volume of these present average trees was determined. The ratio of the present volume to the future volume was determined for each species and 2-inch diameter class. One-tenth of the volume growth in 10 years was used as the estimate of current annual gross growth.

Ingrowth volume was estimated by plotting the number of trees over d.b.h. classes. The d.o.b. growth curves described above were used to determine the number of trees smaller than 5.0 inches d.b.h. expected to reach that diameter or larger in a 12-month period. The same type of estimate was made for trees expected to reach sawtimber size 11.0 inches d.b.h. The average volume of trees 5.1 and 11.1 inches in diameter was multiplied by the number of trees moving into the poletimber and sawtimber classes.

Gross growth and ingrowth measurements were adjusted to net estimates on the basis of mortality data obtained from the field plots.

Timber-Cut Estimates

Estimates of timber cut in Iowa are based primarily upon a special study conducted by the Central States Forest Experiment Station in 1954. This study included a sampling survey of wood-product producers and wood-users in Iowa. An area sample was used to determine the volume of timber cut for fuelwood, fence posts, and miscellaneous farm timbers. Data from the U. S. Department of Commerce, Bureau of the Census, 1954 Census of Manufacturers also were used to develop lumber production estimates.

Stump-measurements of trees cut within a 3-year period were taken in the course of the inventory field work. When converted to volumes these stump records strengthened break-down of timber-cut volume by species, diameter, and geographic region.

Complete canvasses of pulpwood and veneer-log using industries in the Central and Lake States since 1954 provided additional data on timber cut in Iowa.

Accuracy of Estimates

Statistical analysis of the Iowa forest area and timber volume data indicates sampling errors[1] as follows:

	Percent (plus or minus)
1. Commercial forest area in the State	1.1
2. Commercial forest area by geographic units	from 1.5 to 3.1
3. Growing stock volume in the State	3.6
4. Growing stock volume by geographic units	from 5.4 to 8.4
5. Sawtimber volume in the State	4.7
6. Sawtimber volume by geographic units	from 6.6 to 11.5

[1] At one standard deviation: That is, the chances are two out of three that the calculated acreages and volumes do not differ from the totals that would have been obtained by 100 percent measurement by more than the percentages indicated.

The estimates of sampling error do not include errors resulting from mistakes in measurement or judgment. All phases of field and office work were closely supervised to keep such errors to a minimum.

Since the percentage error increases with each subdivision of the total, small acreages or volumes may have large errors; in some cases, therefore, these figures may indicate only relative magnitudes. The following tabulation indicates the reliability of subdivisions of forest areas and volumes in the tables of this report:

Commercial Forest		Growing Stock		Sawtimber	
Area	Sampling Error	Volume	Sampling Error	Volume	Sampling Error
Thousand Acres	*Percent*	*Million cu. ft.*	*Percent*	*Million bd. ft.*	*Percent*
2,595	1	1,382	4	5,092	5
1,000	2	500	6	1,000	11
500	3	100	13	500	15
100	6	50	19	100	34
50	8	10	43	50	47
10	18	1	135	10	106

Timber-cutting estimates are obtained primarily by canvassing producers of primary timber products. These estimates are usually reported as either production items such as lumber or as receipts of roundwood such as veneer logs or pulpwood at wood-using plants. These data are mathematically converted to board-feet (International ¼-inch log rule) or cubic-foot volume after studies of mill over-run and woods residues have been made.

Possible errors include reporting mistakes, errors in over-run and residue factors, and sampling errors. When data from several independent studies are combined, as was necessary in establishing a lumber production figure for Iowa, it is impossible to compute an exact sampling error. Every effort was made to develop the most reliable timber-cut estimates possible from the data available. The following tabulation shows the computed sampling error by commodity as found in the special timber-cut study made in 1954:

Commodity	Percentage of all timber cut from growing stock	Sampling Error
	Percent	Percent ±
Sawlogs	54.4	13
Fuelwood	33.6	19
Veneer logs	3.8	1
Cooperage bolts	2.8	1
Fence posts	2.8	33
Pulpwood	.9	1
Miscellaneous	1.7	68
Total	100.0	12.3

EXPLANATION OF TERMS

Forest Land

Includes (a) land which is at least 10 percent stocked by trees of any size and capable of producing timber or other wood products, or of exerting an influence on the climate or on the water regime; (b) land from which the trees described in (a) have been removed to less than 10 percent stocking and which has not been developed for other use; (c) afforested areas.

The minimum area that qualifies as forest land is one acre. Strips of timber must be at least 120 feet wide to qualify. Conversely, clearings, streams, treeless strips and unimproved roads less than 1 acre in area or less than 120 feet wide within forest areas are classified as forest land. Improved rights-of-way, such as graded roads, railroads, or transmission lines, are classified as nonforest regardless of width.

Commercial forest land.—Forest land which is (a) producing, or physically capable of producing, usable crops of wood (usually sawtimber), (b) economically available now or prospectively, and (c) not withdrawn from timber utilization.

Noncommercial forest land.—Forest land withdrawn from timber utilization through statute, ordinance, or administrative order but which otherwise qualifies as commercial forest land.

Forest Type

Oak-hickory.—Forests in which 50 percent or more of the stand is upland oaks or hickory, singly or in combination; except where bur oak makes up 50 percent or more of the stand (in which case the stand is classified "bur oak"); and except where redcedar makes up 25 percent or more of the stand (in which case the stand is classified "hardwood-redcedar"). Common associates include elm, maple, and black walnut.

Bur oak.—Forests in which 50 percent or more of the stand is bur oak.

Hardwood-redcedar.—Forests in which 25 percent or more of the stand is redcedar and the remainder is hardwoods, usually oaks.

Northern hardwoods.—Forests in which 50 percent or more of the stand is hard maple or yellow birch, singly or in combination. Common associates include elm and basswood.

Elm-ash-cottonwood.—Forests in which 50 percent or more of the stand is elm, ash, or cottonwood, singly or in combination. Common associates include willow, sycamore, and maple.

Aspen-birch.—Forests in which 50 percent or more of the stand is aspen, balsam poplar, or paper birch, singly or in combination.

Tree Size and Condition

Sawtimber trees.—Trees of commercial species that contain at least one merchantable sawlog as defined by regional practice and which are of the following minimum diameters at breast height (d.b.h.): softwoods 9.0 inches and hardwoods 11.0 inches.

Large sawtimber trees.—Hardwood and softwood sawtimber trees 15.0 inches d.b.h. and larger.

Small sawtimber trees.—Hardwood and softwood sawtimber trees less than 15.0 inches d.b.h.

Poletimber trees.—Trees of commercial species that meet regional specifications of soundness and form, and are of the following diameters at breast height: softwoods 5.0 to 9.0 inches, hardwoods 5.0 to 11.0 inches.

Seedling and sapling trees.—Live trees of commercial species less than 5.0 inches in diameter at breast height, and of good form and vigor.

Cull trees.—Live trees of sawtimber or poletimber size that are unmerchantable for sawlogs now or prospectively because of defect, rot, or species (such as sumac, redbud, hophornbeam).

Rotten cull trees.—Live trees of sawtimber or poletimber size that fail to meet regional specifications of proportion of sound volume to total volume.

Sound cull trees.—Live trees of sawtimber or poletimber size that meet regional specifications of freedom from rot but will not make at least one merchantable sawlog now or prospectively according to regional specifications because of roughness, poor form, or species.

Volume

All-timber volume.—Net volume in cubic feet of live and salvable dead sawtimber trees and poletimber trees of commercial species, and cull trees of all species from stump to a minimum 4.0-inch top inside bark. Includes bole only of softwoods but both bole and limbs of hardwoods to a minimum 4.0-inch diameter inside bark.

Live sawtimber volume.—Net volume in board-feet, International ¼-inch rule, of live sawtimber trees of commercial species to a merchantable top not less than 8.0 inches diameter inside bark for hardwood species and less than 6.0 inches d.i.b. for softwood species.

Merchantable top.—The point on the bole of sawtimber trees above which a minimum merchantable sawlog, as defined regionally, cannot be produced.

Growing stock volume.—Net volume in cubic feet of live sawtimber trees and live poletimber trees from stump to a minimum 4.0-inch top (of central stem) inside bark.

Hardwood limbs.—Limbs of live hardwood sawtimber trees and sawtimber size cull hardwood trees to a minimum diameter of 4.0 inches inside bark.

Upper stem portion.—Net volume in cubic feet of bole of sawtimber trees between merchantable top and a minimum top diameter of 4.0 inches inside bark on the central stem.

Stocking

Stocking is the extent to which growing space is effectively utilized by present or potential growing stock trees of commercial species. "Degree of stocking" is synonymous with "percent of growing space occupied" and means the ratio of actual stocking to full stocking for comparable sites and stands.

Well-stocked stands.—Stands that are 70 percent or more stocked with present or potential growing stock trees.

Medium-stocked stands.—Stands that are 40 to 69 percent stocked with present or potential growing-stock trees.

Poorly stocked stands.—Stands that are 10 to 39 percent stocked with present or potential growing-stock trees.

Nonstocked area.—Areas that are 0 to 10 percent stocked with present or potential growing-stock trees.

Site

Forest Site.—Site class is determined by the average number of 16-foot merchantable logs that an area is capable of producing in mature trees. All stem sections ½ log (8 feet) in length or longer, suitable for cross ties or rough lumber were considered to be merchantable. Merchantable heights were estimated to the nearest ½ log. Where mature trees were not present, site was estimated from soil and moisture conditions, topography, exposure, and appearance of vegetation. The following site classes were recognized:

Good.—Areas that can produce hardwood trees averaging three or more logs at maturity.

Fair.—Areas that can produce hardwood trees averaging 2 to 2½ logs at maturity.

Poor —Areas than can produce hardwood trees that average 1 to 1½ logs at maturity.

Stand-size

Sawtimber stands.—Stands with sawtimber trees having a minimum net volume per acre of 1,500 board-feet, International ¼-inch rule.

Large sawtimber stands.—Sawtimber stands having more than 50 percent of the board-foot volume in large sawtimber trees.

Small sawtimber stands.—Sawtimber stands having 50 percent or more of the net board-foot volume in small sawtimber trees.

Poletimber stands.—Stands failing to meet the sawtimber stand specifications, but at least 10 percent stocked with poletimber and larger (5.0 inches d.b.h. and larger) trees and with at least half the minimum stocking in poletimber trees.

Seedling and sapling stands.—Stands not qualifying as either sawtimber or poletimber stands, but at least 10 percent stocked with trees of commercial species and with at least half the minimum stocking in seedling and sapling trees.

Nonstocked and other areas not elsewhere classified.—Areas not qualifying as sawtimber, poletimber, or seedling and sapling stands.

Diameter

Diameter at breast height (d.b.h.)—Tree diameter, outside bark, measured at 4.5 feet above average ground level.

Diameter class.—Trees were recorded in 2-inch diameter classes, each class including 1.0 inch below and 0.9 inch above the midpoint of the class; e.g., the 8-inch class included all trees ranging from 7.0 to 8.9 inches d.b.h.

Diameter inside bark (d.i.b.)—Tree diameter inside the bark at any point specified.

Hardwood log grade

Grade 1.—Butt logs at least 13.0 inches (uppers at least 16 inches) in diameter inside bark with five-sixths of the surface on the three best faces clear of defect in not more than two cuttings, (minimum length of cutting variable, 3-7 feet, depending upon log diameter and position in tree.) Minimum log length 10 feet. On the average such logs will yield at least 65 percent No. 1 common and better lumber.

Grade 2.—Logs at least 11.0 inches in diameter inside bark with two-thirds of the surface on the three best faces clear of defect in not more than three cuttings, (minimum length of cutting, 3 feet). Minimum log length 8 feet. On the average such logs will yield at least 40 percent No. 1 common and better lumber.

Grade 3.—Merchantable logs at least 8.0 inches in diameter inside bark at the small end, 8 feet long with one-half of the surface on the three best faces clear of defect in cuttings 2 feet long. Maximum cull deduction 50 percent. On the average such logs will yield less than 25 percent No. 1 common and better lumber.

Tie and timber.—This class includes the roughest logs considered merchantable. Tie and timber logs must be at least 8.0 inches in diameter inside bark at the small end and at least 8 feet long. No limit is placed on surface defects as long as they do not extend into the interior enough to affect the strength of the contained tie or timber.

Growth

Net annual growth of sawtimber.—The change during a specified year in net board-foot volume of live sawtimber on commercial forest land resulting from natural causes.

Net annual growth of growing stock.—The change during a specified year in net cubic-foot volume of growing stock on commercial forest land resulting from natural causes.

Ingrowth.—The total volume of all trees that during the year reach the minimum diameter (5.0 inches) for growing stock or the minimum diameter for sawtimber of 9.0 inches for softwoods and 11.0 for hardwoods.

Mortality

Annual timber mortality.—The net volume lost from live sawtimber or growing stock on commercial forest land during a specified year because of death from natural causes.

Timber Cut

Annual cut of live sawtimber.—The net board-foot volume of live sawtimber trees cut or killed by logging, and by land clearing and cultural operations, on commercial forest land during a specified year.

Annual cut of growing stock.—The net cubic-foot volume of live sawtimber and poletimber trees cut or killed by logging, or by land clearing and cultural operations, on commercial forest land during a specified year.

Logging residues from growing stock.—The net cubic-foot volume of live sawtimber and poletimber trees cut or killed by logging on commercial forest land and not converted to timber products.

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Tree Species

Softwoods

Commercial species:	
Baldcypress	*Taxodium distichum*
Hemlock, eastern	*Tsuga canadensis*
Pine:	
Eastern white pine	*Pinus strobus*
Jack pine	*P. banksiana*
Loblolly pine	*P. taeda*
Pitch pine	*P. rigida*
Red (Norway) pine	*P. resinosa*
Shortleaf pine	*P. echinata*
Virginia pine	*P. virginiana*
Redcedar, eastern	*Juniperus virginiana*

Hardwoods

Commercial species:	
Ash:	
Blue ash	*Fraxinus quadrangulata*
Green ash	*F. pennsylvanica*
White ash	*F. americana*
Aspen:	
Bigtooth aspen	*Populus grandidentata*
Quaking (trembling) aspen	*P. tremuloides*
Basswood	*Tilia spp.*
Beech, american	*Fagus grandifolia*
Birch	*Betula spp.*
Buckeye	*Aesculus spp.*
Butternut	*Juglans cinerea*
Catalpa	*Catalpa spp.*
Cherry, black	*Prunus serotina*
Cottonwood:	
Eastern cottonwood	*Populus deltoides*
Swamp cottonwood	*P. heterophylla*
Cucumbertree	*Magnolia acuminata*
Dogwood	*Cornus spp.*
Elm:	
American elm	*Ulmus americana*
Rock elm	*U. thomasii*
Slippery elm	*U. rubra*
Winged elm	*U. alata*
Gum:	
Blackgum (black tupelo)	*Nyssa sylvatica*
Sweetgum (red)	*Liquidambar styraciflua*
Water tupelo (tupelo-gum)	*Nyssa aquatica*
Hackberry	*Celtis occidentalis*
Hickory	*Carya spp.*
Honeylocust	*Gleditsia triacanthos*
Kentucky coffeetree	*Gymnocladus dioicus*
Locust, black	*Robinia pseudoacacia*
Maple, hard:	
Black maple	*Acer nigrum*
Sugar maple	*A. saccharum*
Maple, soft:	
Boxelder	*A. negundo*
Red maple	*A. rubrum*
Silver maple	*A. saccharinum*
Mulberry, red	*Morus rubra*
Oak, red:	
Black oak	*Quercus velutina*
Cherrybark oak (swamp red oak)	*Q. falcata var. pagodaefolia*
Northern red oak	*Q. rubra*
Pin oak	*Q. palustris*
Scarlet oak	*Q. coccinea*
Shingle oak	*Q. imbricaria*
Southern red oak	*Q. falcata*
Water oak	*Q. nigra*
Willow oak	*Q. phellos*

Oak, white:	
Bur oak	*Q. macrocarpa*
Chestnut oak	*Q. prinus*
Chinkapin oak	*Q. muehlenbergii*
Overcup oak	*Q. lyrata*
Post oak	*Q. stellata*
Swamp chestnut oak	*Q. michauxii*
Swamp white oak	*Q. bicolor*
White oak	*Q. alba*
Osage-orange	*Maclura pomifera*
Persimmon, common	*Diospyros virginiana*
Sassafras	*Sassafras albidum*
Sycamore, american	*Platanus occidentalis*
Walnut, black	*Juglans nigra*
Willow	*Salix spp.*
Yellow-poplar	*Liriodendron tulipifera*
Noncommercial species:	
Ailanthus (tree of heaven)	*Ailanthus altissima*
Hawthorn	*Crataegus spp.*
Hophornbeam, eastern (ironwood)	*Ostrya virginiana*
Pawpaw	*Asimina triloba*
Plum, wild	*Prunus spp.*
Redbud, eastern	*Cercis canadensis*
Serviceberry	*Amelanchier spp.*
Sourwood	*Oxydendrum arboreum*
Sumac	*Rhus spp.*

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Tables

TABLE 1 — *Total land and forest area by geographic region and county, Iowa, 1954*

NORTHEASTERN SURVEY UNIT

County	Total land area 1/	Forest area		County	Total land area 1/	Forest area	
	Thousand acres	*Thousand acres*	*Percent*		*Thousand acres*	*Thousand acres*	*Percent*
Allamakee	409	132	32	Jackson	412	82	20
Benton	460	20	4	Johnson	397	41	10
Buchanan	364	17	5	Jones	374	42	11
Cedar	374	23	6	Linn	456	46	10
Clayton	498	120	24	Muscatine	281	30	11
Clinton	445	30	7	Poweshiek	377	17	5
Delaware	367	27	7	Scott	290	15	5
Dubuque	389	56	14	Toma	461	30	7
Fayette	466	38	8	Winneshiek	440	56	13
Iowa	374	30	8				
				Total	7,634	852	11

SOUTHEASTERN SURVEY UNIT

County	Total land area 1/	Forest area		County	Total land area 1/	Forest area	
	Thousand acres	*Thousand acres*	*Percent*		*Thousand acres*	*Thousand acres*	*Percent*
Appanoose	335	56	17	Lucas	278	51	18
Boone	367	30	8	Madison	362	50	14
Clarke	275	39	14	Mahaska	366	31	8
Dallas	382	36	9	Marion	363	52	14
Daris	326	51	16	Monroe	278	71	26
Decatur	339	57	17	Polk	380	32	8
Des Moines	262	40	15	Ringgold	344	27	8
Guthrie	381	38	10	Van Buren	312	64	21
Henry	282	36	13	Wapello	280	49	18
Jefferson	279	37	13	Warren	366	44	12
Keokuk	371	35	9	Washington	363	37	10
Lee	334	81	24	Wayne	340	27	8
Louisa	258	41	16	Webster	459	26	6
				Total	8,682	1,138	13

1/ Source: Areas of the United States, 1950, U. S. Bureau of the Census.
Does not include areas listed as inland water.

WESTERN SURVEY UNIT

County	Total land area 1/	Forest area		County	Total land area 1/	Forest area	
	Thousand acres	*Thousand acres*	*Percent*		*Thousand acres*	*Thousand acres*	*Percent*
Adair	364	12	3	Humboldt	278	6	2
Adams	273	16	6	Ida	276	2	1
Audubon	287	4	1	Jasper	471	31	7
Black Hawk	363	17	5	Kossuth	627	8	1
Bremer	281	15	5	Lyon	376	4	1
Buena Vista	367	5	1	Marshall	367	14	4
Butler	373	15	4	Mills	285	25	9
Calhoun	366	2	1	Mitchell	299	10	3
Carroll	367	5	1	Monona	446	48	11
Cass	358	9	3	Montgomery	270	10	4
Cerro Gordo	369	4	1	O'Brien	368	4	1
Cherokee	367	11	3	Osceola	255	2	8
Chickasaw	323	16	5	Page	342	12	4
Clay	365	8	2	Palo Alto	359	6	2
Crawford	458	14	3	Plymouth	552	12	2
Dickinson	244	4	2	Pocahontas	371	1	2/
Emmet	253	4	2	Pottawattamie	617	27	4
Floyd	322	9	3	Sac	370	6	2
Franklin	375	4	1	Shelby	376	5	1
Fremont	335	31	9	Sioux	490	3	1
Greene	364	12	3	Story	364	13	4
Grundy	321	1	2/	Taylor	338	21	6
Hamilton	369	9	2	Union	273	22	8
Hancock	365	3	1	Winnebago	257	3	1
Hardin	367	14	4	Woodbury	558	25	4
Harrison	445	44	10	Worth	257	5	2
Howard	301	11	4	Wright	369	6	2
				Total	19,553	630	3

2/ Less than 0.5 percent.

TABLE 2 – *Land area by major use and physiographic region, Iowa, 1954*

Land use	Total		Northeast		Southeast		Western	
	Thousand acres	*Percent*	*Thousand acres*	*Percent*	*Thousand acres*	*Percent*	*Thousand acres*	*Percent*
Forest:								
Commercial	2,595	7.2	846	11.1	1,127	13.0	622	3.2
Noncommercial:								
Withdrawn from timber use	25	.1	6	.1	11	.1	8	1/
Nonproductive	-	-	-	-	-	-	-	-
Total forest land	2,620	7.3	852	11.2	1,138	13.1	630	3.2
Nonforest	33,249	92.7	6,782	88.8	7,544	86.9	18,923	96.8
Total land area	35,869	100.0	7,634	100.0	8,682	100.0	19,553	100.0

1/ Less than 0.05 percent

TABLE 3 — *Commercial forest area by ownership and geographic region, Iowa, 1954*

Ownership class	Total		Northeastern	Southeastern	Western
	Thousand acres	*Percent*	*Thousand acres*	*Thousand acres*	*Thousand acres*
Federal:					
National forest	2.7	0.1	-	2.7	-
Indian	1.0	1/	1.0	-	-
Other	9.2	.4	7.6	1.6	-
Total	12.9	0.5	8.6	4.3	-
State	22.0	0.9	7.2	12.8	2.0
County and municipal	1.9	.1	.6	.5	.8
Private:					
Farm	2,282.1	87.9	764.0	965.1	553.0
Industrial and other	276.1	10.6	65.6	144.3	66.2
Total	2,558.2	98.5	829.6	1,109.4	619.2
All ownerships	2,595.0	100.0	846.0	1,127.0	622.0

1/ Less than 0.05 percent

TABLE 4 — *Commercial forest area by stand-size and geographic region, Iowa, 1954*

Stand-size class	Total		Northeastern		Southeastern		Western	
	Thousand acres	*Percent*	*Thousand acres*	*Percent*	*Thousand acres*	*Percent*	*Thousand acres*	*Percent*
Large sawtimber stands	738	28.4	309	36.5	224	19.9	205	33.0
Small sawtimber stands	268	10.3	133	15.7	99	8.8	36	5.8
Poletimber stands	830	32.0	248	29.3	396	35.1	186	29.9
Seedling and sapling stands	287	11.1	44	5.2	192	17.0	51	8.2
Nonstocked and other areas	472	18.2	112	13.3	216	19.2	144	23.1
Total	2,595	100.0	846	100.0	1,127	100.0	622	100.0

TABLE 5 — *Commercial forest area by forest type and geographic region, Iowa, 1954*

Forest type	Total		Northeastern		Southeastern		Western	
	Thousand acres	*Percent*	*Thousand acres*	*Percent*	*Thousand acres*	*Percent*	*Thousand acres*	*Percent*
Oak-hickory	1,036	39.9	364	43.0	567	50.3	105	16.9
Northern hardwoods	78	3.0	66	7.8	5	.5	7	1.1
Elm-ash-cottonwood	1,219	47.0	346	40.9	503	44.6	370	59.5
Aspen-birch	20	.8	15	1.8	-	-	5	.8
Bur oak	202	7.8	36	4.3	37	3.3	129	20.7
Hardwood-redcedar	40	1.5	19	2.2	15	1.3	6	1.0
Total	2,595	100.0	846	100.0	1,127	100.0	622	100.0

TABLE 6 — *Commercial forest area by forest type and stand-size class, Iowa, 1954, (in thousand acres)*

Forest type	Total	Large sawtimber stands	Small sawtimber stands	Pole-timber stands	Seedling & sapling stands	Nonstocked and other areas
Oak-hickory	1,036	220	131	385	140	160
Northern hardwoods	78	44	19	10	-	5
Elm-ash-cottonwood	1,219	444	100	323	120	232
Aspen-birch	20	-	5	10	-	5
Bur oak	202	30	13	78	16	65
Hardwood-redcedar	40	-	-	24	11	5
Total	2,595	738	268	830	287	472
Percent	100.0	28.4	10.3	32.0	11.1	18.2

TABLE 7 — *Commercial forest area by physiographic site and stand-size class, Iowa, 1954*

Physiographic site	Total		Large sawtimber	Small sawtimber	Pole-timber stands	Seedling & sapling stands	Nonstocked and other areas
	Thousand acres	*Percent*	*Thousand acres*	*Thousand acres*	*Thousand acres*	*Thousand acres*	*Thousand acres*
Level upland	343	13.2	96	41	107	35	64
Rough upland	1,587	61.2	371	160	584	179	293
Bottomland	665	25.6	271	67	139	73	115
Total	2,595	100.0	738	268	830	287	472

TABLE 8 — *Net board-foot volume on commercial forest area by ownership and geographic region, Iowa, 1954*

Ownership	State total		Northeastern	Southeastern	Western
	Million bd. ft.	*Percent*	*Million bd. ft.*	*Million bd. ft.*	*Million bd. ft.*
Public:					
National forest	4	0.1	-	4	-
Indian	3	.1	3	-	-
Other Federal	21	.4	19	2	-
State	40	.7	18	18	4
County and Municipal	3	.1	1	1	1
Total public	71	1.4	41	25	5
Private:					
Farm	4,515	88.7	1,932	1,391	1,192
Industrial and other	506	9.9	167	208	131
Total private	5,021	98.6	2,099	1,599	1,323
All ownerships	5,092	100.0	2,140	1,624	1,328

TABLE 9 — *Net board-foot volume on commercial forest area by species and geographic region, Iowa, 1954*

Species	Total		North-eastern	South-eastern	Western
	Million bd. ft.	*Percent*	*Million bd. ft.*	*Million bd. ft.*	*Million bd. ft.*
Eastern redcedar	6	0.1	3	3	-
Black ash	39	.8	28	-	11
American elm	742	14.6	252	285	205
Slippery elm	330	6.5	144	92	94
Aspen	15	.3	15	-	-
Cottonwood	601	11.8	166	116	319
Basswood	342	6.7	181	83	78
Silver maple	462	9.1	145	174	143
Sycamore	9	.2	9	-	-
Boxelder	23	.4	11	3	9
Butternut	23	.4	22	1	-
Black cherry	23	.4	18	3	2
Hackberry	29	.6	8	5	16
Willow	130	2.6	42	63	25
Other soft hardwoods	11	.2	1	6	4
White oak	504	9.9	219	247	38
Bur oak	360	7.1	79	126	155
Other white oaks	23	.4	11	9	3
Black oak	96	1.9	75	21	-
Northern red oak	532	10.4	290	185	57
Other red oaks	135	2.7	96	22	17
Hickory	155	3.0	79	46	30
White ash	161	3.2	68	33	60
Sugar maple	98	1.9	71	13	14
River birch	37	.7	16	14	7
Black walnut	193	3.8	86	67	40
Other hard hardwoods	13	.3	5	7	1
Total	5,092	100.0	2,140	1,624	1,328

TABLE 10 — *Net board-foot volume on commercial forest area by forest type and geographic region, Iowa, 1954*

Forest type	Total		Northeastern	Southeastern	Western
	Million bd. ft.	*Percent*	*Million bd. ft.*	*Million bd. ft.*	*Million bd. ft.*
Oak-hickory	1,701	33.4	863	705	133
Northern hardwoods	303	5.9	236	41	26
Elm-ash-cottonwood	2,838	55.7	979	816	1,043
Aspen-birch	14	.3	14	-	-
Bur oak	227	4.5	41	60	126
Hardwood-redcedar	9	.2	7	2	-
Total	5,092	100.0	2,140	1,624	1,328

TABLE 11 — *Net board-foot volume on commercial forest area by physiographic site and stand-size class, Iowa, 1954*

Physiographic site	Total		Large sawtimber stands	Small sawtimber stands	Pole-timber stands	Seedling & sapling stands	Nonstocked and other areas
	Million bd. ft.	*Percent*	*Million bd. ft.*	*Million bd. ft.*	*Million bd. ft.*	*Million bd. ft.*	*Million bd. ft.*
Level upland	743	14.6	496	161	68	5	13
Rough upland	2,492	48.9	1,441	521	329	58	143
Bottomland	1,857	36.5	1,414	223	101	55	64
Total	5,092	100.0	3,351	905	498	118	220

TABLE 12 — *Average board-foot volume per acre by physiographic site and stand-size class, Iowa, 1954*

Physiographic site	Total	Large sawtimber stands	Small sawtimber stands	Pole-timber stands	Seedling & sapling stands	Nonstocked and other areas
Level upland	2,166	5,167	3,927	636	143	203
Rough upland	1,570	3,884	3,256	563	324	488
Bottomland	2,792	5,218	3,328	727	753	557
Total	1,962	4,541	3,377	600	411	466

TABLE 13 — *Net board-foot volume on commercial forest area by tree-diameter class and geographic region, Iowa, 1954*

Tree-diameter class (inches)	Total		Northeastern		Southeastern		Western	
	Million bd. ft.	*Percent*	*Million bd. ft.*	*Percent*	*Million bd. ft.*	*Percent*	*Million bd. ft.*	*Percent*
12-14 1/	1,540	30.2	717	33.5	526	32.4	297	22.4
16-18	1,501	29.5	649	30.3	482	29.7	370	27.9
20-22	927	18.2	351	16.4	270	16.6	306	23.0
24-26	476	9.4	173	8.1	162	10.0	141	10.6
28+	648	12.7	250	11.7	184	11.3	214	16.1
Total	5,092	100.0	2,140	100.0	1,624	100.0	1,328	100.0

1/ Includes 10" softwood sawtimber

TABLE 14 — *Net board-foot volume on commercial forest area by species and stand-size class, Iowa, 1954*

Species	Total		Large sawtimber stands	Small sawtimber stands	Pole-timber stands	Seedling & sapling stands	Nonstocked and other areas
	Million bd. ft.	*Percent*	*Million bd. ft.*	*Million bd. ft.*	*Million bd. ft.*	*Million bd. ft.*	*Million bd. ft.*
Eastern redcedar	6	0.1	-	1	2	2	1
Black ash	39	.8	34	4	1	-	-
American elm	742	14.6	469	92	99	18	64
Slippery elm	330	6.5	239	50	29	4	8
Aspen	15	.3	1	14	-	-	-
Cottonwood	601	11.8	527	48	19	-	7
Basswood	342	6.7	256	37	25	4	20
Silver maple	462	9.1	375	73	12	2	1/
Sycamore	9	.2	9	-	-	-	-
Boxelder	23	.4	11	3	5	3	1
Butternut	23	.4	15	6	1	1	-
Black cherry	23	.4	10	5	4	4	-
Hackberry	29	.6	24	4	1	-	-
Willow	130	2.6	36	31	34	22	7
Other soft hardwoods	11	.2	8	2	1	-	-
White oak	504	9.9	253	141	66	30	14
Bur oak	360	7.1	196	65	59	2	38
Other white oaks	23	.4	16	6	1	-	-
Black oak	96	1.9	33	49	6	8	-
Northern red oak	532	10.4	378	108	38	-	8
Other red oaks	135	2.7	73	27	17	-	18
Hickory	155	3.0	52	48	39	1/	16
White ash	161	3.2	116	21	2	11	11
Sugar maple	98	1.9	85	9	1	-	3
River birch	37	.7	33	1	3	-	-
Black walnut	193	3.8	100	61	23	6	3
Other hard hardwoods	13	.3	2	-	9	1	1
Total	5,092		3,351	906	497	118	220
Percent		100.0	65.8	17.8	9.8	2.3	4.3

1/ Less than 0.5 million board-feet

TABLE 15 — *Net board-feet volume on commercial forest area by species and tree-diameter class, Iowa, 1954*
(In million board-feet)

Species	Total	Tree-diameter class (inches)					
		12 - 14	16 - 18	20 - 22	24 - 26	28 - 30	32 +
Eastern redcedar	6	1/ 6	-	-	-	-	-
Black ash	39	11	21	7	-	-	-
American elm	742	182	228	158	83	30	61
Slippery elm	330	103	113	61	14	39	-
Aspen	15	11	4	-	-	-	-
Cottonwood	601	53	85	89	110	95	169
Basswood	342	99	135	76	15	7	10
Silver maple	462	86	124	142	61	24	25
Sycamore	9	-	-	-	-	9	-
Boxelder	23	15	6	-	2	-	-
Butternut	23	11	10	2	-	-	-
Black cherry	23	17	6	-	-	-	-
Hackberry	29	9	7	2	4	7	-
Willow	130	75	38	5	12	-	-
Other soft hardwoods	11	6	5	-	-	-	-
White oak	504	198	166	85	24	24	7
Bur oak	360	137	106	56	37	19	5
Other white oaks	23	7	7	2	-	7	-
Black oak	96	33	33	18	-	12	-
Northern red oak	532	147	174	124	54	16	17
Other red oaks	135	51	31	22	23	-	8
Hickory	155	108	43	4	-	-	-
White ash	161	46	34	26	8	47	-
Sugar maple	98	35	26	18	9	10	-
River birch	37	6	13	7	11	-	-
Black walnut	193	85	76	23	9	-	-
Other hard hardwoods	13	3	10	-	-	-	-
Total	5,092	1/ 1,540	1,501	927	476	346	302
Percent	100.0	30.2	29.5	18.2	9.4	6.8	5.9

1/ Includes 10-inch softwood sawtimber

TABLE 16 – *Net board-foot volume on commercial forest land by species and forest type, Iowa, 1954*
(In million board-feet)

Species	Total	Forest types					
		Oak-Hickory	Northern hardwoods	Elm-ash-cottonwood	Aspen-birch	Bur oak	Hardwood-redcedar
Eastern redcedar	6	1	-	-	-	-	5
Black ash	39	2	8	29	-	-	-
American elm	742	116	4	611	-	9	2
Slippery elm	330	60	23	244	-	3	-
Aspen	15	8	1	-	6	-	-
Cottonwood	601	2	-	594	-	5	-
Basswood	342	61	119	160	-	2	-
Silver maple	462	-	-	462	-	-	-
Sycamore	9	-	-	9	-	-	-
Boxelder	23	1	-	22	-	-	-
Butternut	23	5	11	7	-	-	-
Black cherry	23	9	-	13	-	1	-
Hackberry	29	5	-	24	-	-	-
Willow	130	-	-	130	-	-	-
Other soft hardwoods	11	-	4	6	-	1	-
White oak	504	480	5	16	1	2	-
Bur oak	360	107	1	81	-	171	-
Other white oaks	23	5	-	18	-	1/	-
Black oak	96	80	-	5	-	11	-
Northern red oak	532	437	51	37	-	7	-
Other red oaks	135	77	8	38	2	10	-
Hickory	155	122	5	22	-	4	2
White ash	161	20	4	136	-	1	-
Sugar maple	98	27	56	15	-	-	-
River birch	37	2	-	35	-	-	-
Black walnut	193	74	3	111	5	-	-
Other hard hardwoods	13	-	-	13	-	-	-
Total	5,092	1,701	303	2,838	14	227	9
Percent	100.0	33.4	5.9	55.7	3	4.5	0.2

1/ Less than 0.5 million board-feet

TABLE 17 – *Hardwood sawtimber volume by log grades and geographic regions, Iowa, 1954*

Region	Total	Log grade 1		Log grade 2		Log grade 3		Tie & Timber grade	
	Million bd. ft.	*Million bd. ft.*	*Percent*	*Million bd. ft.*	*Percent*	*Million bd. ft.*	*Percent*	*Million bd. ft.*	*Percent*
Northeastern	2,137	181	8	339	16	849	40	768	36
Southeastern	1,621	172	10	302	19	498	31	649	40
Western	1,328	231	17	340	26	378	28	379	29
State	5,086	584	12	981	19	1,725	34	1,796	35

TABLE 18 – *Hardwood sawtimber volume by log grades and tree diameter class, Iowa, 1954*

Tree diameter class			Log grade 1	Log grade 2	Log grade 3	Tie and Timber
Inches	*Million bd. ft.*	*Percent*	*Million bd. ft.*	*Million bd. ft.*	*Million bd. ft.*	*Million bd. ft.*
12-14	1,534	30	9	99	598	828
16-18	1,501	30	139	366	476	520
20+	2,051	40	436	516	651	448
Total	5,086	100	584	981	1,725	1,796

TABLE 19 – *Hardwood sawtimber volume by species group and log grade, Iowa, 1954*

Species group	Total	Log grade 1		Log grade 2		Log grade 3		Tie and timber grade	
	Million board-feet	*Million board-feet*	*Percent*	*Million board-feet*	*Percent*	*Million board-feet*	*Percent*	*Million board-feet*	*Percent*
American elm.	1,072	147	14	214	20	414	38	297	28
Cottonwood	601	172	29	118	19	167	28	144	24
Silver maple	462	44	9	74	16	156	34	188	41
White oaks 1/.	527	27	5	116	22	159	30	225	43
Bur oak	360	-	-	78	22	51	14	231	64
Red oaks	763	25	3	86	11	289	38	363	48
Hickory	155	-	-	8	5	75	49	72	46
Black walnut	193	32	17	53	27	97	50	11	6
Other hardwoods.	953	137	14	234	25	317	33	265	28
Total	5,086	584	12	981	19	1,725	34	1,796	35

1/ Includes all white oaks except bur oak

TABLE 20—*Net cubic-foot volume of growing stock on commercial forest area by species and geographic region, Iowa, 1954*

Species	Total		Northeastern	Southeastern	Western
	Million cu. ft.	*Percent*	*Million cu. ft.*	*Million cu. ft.*	*Million cu. ft.*
Eastern redcedar	3.8	0.3	2.1	1.4	0.3
Black ash	11.4	.8	7.9	-	3.5
American elm	206.6	15.0	70.1	83.5	53.0
Slippery elm	88.2	6.4	34.8	30.6	22.8
Aspen	15.0	1.1	14.8	.2	-
Cottonwood	120.4	8.7	32.0	22.8	65.6
Basswood	83.0	6.0	46.5	18.6	17.9
Silver maple	113.9	8.2	33.4	48.5	32.0
Sycamore	1.7	.1	1.7	-	-
Hackberry	9.9	.7	2.2	3.4	4.3
Willow	61.9	4.5	11.7	34.9	15.3
Other soft hardwoods. . . .	25.6	1.9	16.5	5.0	4.1
White oak	132.5	9.6	57.2	63.8	11.5
Other white oaks	112.2	8.1	27.7	37.3	47.2
Northern red oak.	126.8	9.2	69.2	41.3	16.3
Other red oaks	65.6	4.7	42.2	17.5	5.9
Hickory	63.6	4.6	27.9	24.6	11.1
White ash	45.5	3.3	18.2	9.7	17.6
Sugar maple.	24.9	1.8	18.2	3.7	3.0
Black walnut	52.8	3.8	22.9	19.5	10.4
Other hard hardwoods . . .	16.7	1.2	7.2	7.0	2.5
Total	1,382.0	100.0	564.4	473.3	344.3
Percent		100.0	40.8	34.3	24.9

TABLE 21 – *Net cubic-foot of growing stock on commercial forest area by stand-size class and tree-diameter class, Iowa, 1954*
(In million cubic feet)

Stand-size class	Total	Tree-diameter class (inches) 6	8	10	12	14	16	18	20+
Large sawtimber stands	754.1	9.2	20.2	51.0	58.8	65.6	104.7	103.9	340.7
Small sawtimber stands	267.3	5.3	19.2	49.0	65.0	65.4	29.1	19.3	15.0
Poletimber stands	271.1	38.8	54.6	66.4	33.5	29.5	16.1	11.6	20.6
Seedling and sapling stands	32.0	2.5	2.2	1.4	3.0	6.6	4.1	3.4	8.8
Nonstocked and other areas.	57.5	1.5	2.9	4.0	6.7	9.4	10.2	3.4	19.4
Total	1,382.0	57.3	99.1	171.8	167.0	176.5	164.2	141.6	404.5
Percent	100.0	4.1	7.2	12.4	12.1	12.8	11.9	10.2	29.3

TABLE 22 — *Net cubic-foot volume of growing stock on commercial forest area by species and tree-diameter class, Iowa, 1954*
(In million cubic feet)

Species	Total	6 inches	8 inches	10 inches	12 inches	14 inches	16 inches	18 inches	20+ inches
Eastern redcedar	3.8	0.7	1.9	0.3	0.5	0.4	-	-	-
Black ash	11.4	.2	.6	2.8	1.1	1.5	2.0	1.8	1.4
American elm	206.6	8.8	12.3	25.0	20.3	22.5	26.9	21.0	69.8
Slippery elm	88.2	4.0	7.3	9.6	11.1	11.4	8.6	14.1	22.1
Aspen	15.0	1.2	2.7	7.8	2.0	.5	.8	-	-
Cottonwood	120.4	.8	1.4	2.7	4.1	7.0	9.9	7.0	87.5
Basswood	83.0	1.7	5.1	5.6	9.2	12.2	14.5	13.5	21.2
Silver maple	113.9	2.1	4.7	15.0	9.7	9.3	12.2	12.6	48.3
Sycamore	1.7	1/	-	-	-	-	-	-	1.7
Hackberry	9.9	1.0	1.7	1.3	1.1	.9	.8	.6	2.5
Willow	61.9	2.3	10.4	18.4	9.4	9.6	3.7	4.6	3.5
Other soft hardwoods	25.6	1.8	2.6	3.5	5.6	5.0	3.6	2.7	.8
White oak	132.5	6.3	8.6	16.6	18.6	23.0	16.8	15.3	27.3
Other white oaks	112.2	5.5	8.2	15.2	17.4	15.6	14.6	10.0	25.7
Northern red oak	126.8	3.0	5.2	9.8	16.7	16.4	16.0	18.6	41.1
Other red oaks	65.6	3.9	5.3	7.5	7.5	11.4	7.8	5.3	16.9
Hickory	63.6	8.3	8.9	14.6	13.4	9.6	6.9	1.1	.8
White ash	45.5	1.3	4.8	5.5	4.9	5.5	4.2	2.7	16.6
Sugar maple	24.9	1.0	1.7	2.1	3.9	3.7	2.1	3.1	7.3
Black walnut	52.8	1.7	3.7	6.1	9.3	10.1	11.2	4.3	6.4
Other hard hardwoods	16.7	1.7	2.0	2.4	1.2	.9	1.6	3.3	3.6
Total	1,382.0	57.3	99.1	171.8	167.0	176.5	164.2	141.6	404.5
Percent	100.0	4.1	7.2	12.4	12.1	12.8	11.9	10.2	29.3

1/ Less than 0.05 million cubic feet

TABLE 23 — *Net cubic-foot volume of growing stock on commercial forest area by species and forest type, Iowa, 1954*
(In million cubic feet)

Species	Total	Oak hickory	Northern hardwoods	Elm-ash-cottonwood	Aspen-birch	Bur oak	Hardwood-redcedar
Eastern redcedar	3.8	0.5	-	0.3	-	-	3.0
Black ash	11.4	1.0	1.5	8.6	-	0.3	-
American elm	206.6	33.9	1.5	167.3	0.1	3.1	.7
Slippery elm	88.2	15.7	5.7	64.6	.1	2.1	-
Aspen	15.0	4.7	.7	.3	9.3	-	-
Cottonwood	120.4	.4	-	119.0	-	1.0	-
Basswood	83.0	16.6	29.0	37.0	-	.4	-
Silver maple	113.9	-	-	113.9	-	-	-
Sycamore	1.7	-	-	1.7	-	-	-
Hackberry	9.9	2.3	-	7.5	-	.1	-
Willow	61.9	-	-	61.9	-	-	-
Other soft hardwoods	25.6	7.2	3.6	13.8	.4	.6	-
White oak	132.5	125.1	1.6	4.3	1.2	.3	-
Other white oaks	112.2	34.6	.4	24.3	-	52.9	-
Northern red oak	126.8	103.1	10.4	9.5	1.7	2.1	-
Other red oaks	65.6	45.7	1.5	11.8	.4	6.2	-
Hickory	63.6	50.4	1.2	9.9	.2	1.3	.6
White ash	45.5	5.6	.9	38.7	.1	.2	-
Sugar maple	24.9	7.6	13.3	3.8	.2	-	-
Black walnut	52.8	21.6	.6	29.3	1.1	.2	-
Other hard hardwoods	16.7	1.0	-	15.7	-	-	-
Total	1,382.0	477.0	71.9	743.2	14.8	70.8	4.3
Percent	100.0	34.5	5.2	53.8	1.1	5.1	0.3

TABLE 24 — *Net cubic-foot volume of growing stock on commercial forest area by species and stand-size class, Iowa, 1954*
(In million cubic feet)

Species	Total		Large sawtimber stands	Small sawtimber stands	Pole-timber stands	Seedling & sapling stands	Nonstocked and other areas
		Percent					
Eastern redcedar	3.8	0.3	1/	0.3	2.3	0.9	0.3
Black ash	11.4	.8	9.2	1.5	.4	-	.3
American elm	206.6	15.0	113.7	27.8	44.2	4.2	16.7
Slippery elm	88.2	6.4	52.9	13.2	18.2	1.6	2.3
Aspen	15.0	1.1	1.7	9.0	4.3	-	-
Cottonwood	120.4	8.7	100.6	13.7	3.9	.7	1.5
Basswood	83.0	6.0	58.9	10.2	8.7	1.0	4.2
Silver maple	113.9	8.2	82.8	23.3	7.1	.6	.1
Sycamore	1.7	.1	1.7	-	-	-	-
Hackberry	9.9	.7	6.3	1.2	2.2	-	.2
Willow	61.9	4.5	12.0	10.4	31.9	5.2	2.4
Other soft hardwoods	25.6	1.9	11.3	6.2	5.2	2.2	.7
White oak	132.5	9.6	55.0	36.0	31.0	6.8	3.7
Other white oaks	112.2	8.1	48.9	21.6	31.3	1.0	9.4
Northern red oak	126.8	9.2	78.0	30.3	16.6	.1	1.8
Other red oaks	65.6	4.7	23.2	18.9	17.2	2.0	4.3
Hickory	63.6	4.6	17.5	15.2	25.1	1.2	4.6
White ash	45.5	3.3	28.7	8.4	3.4	2.6	2.4
Sugar maple	24.9	1.8	19.1	4.2	.9	-	.7
Black walnut	52.8	3.8	23.6	15.4	11.1	1.7	1.0
Other hard hardwoods	16.7	1.2	9.0	.5	6.1	.2	.9
Total	1,382.0		754.1	267.3	271.1	32.0	57.5
Percent		100.0	54.6	19.3	19.6	2.3	4.2

1/ Less than 0.05 million cubic feet

TABLE 25 — *Total cubic volume of sound material on commercial forest area by species and class of material, Iowa, 1954*
(In million cubic feet)

Species	Total		Growing stock				Other material			
			Total	*Sawtimber trees* Sawlog portion	Upper stem 1/	Pole-timber	Total	Sound cull 2/	Rotten cull 3/	Hardwood limbs 4/
		Percent								
Eastern redcedar	3.8	0.2	3.8	1.0	0.2	2.6	-	-	-	-
Black ash	13.1	.7	11.4	6.4	1.4	3.6	1.7	0.4	0.2	1.1
American elm	321.9	16.2	206.6	115.1	45.4	46.1	115.3	36.1	9.0	70.2
Slippery elm	125.7	6.3	88.2	51.0	16.3	20.9	37.5	9.8	6.7	21.0
Aspen	17.2	.9	15.0	2.7	.6	11.7	2.2	.4	1.3	.5
Cottonwood	154.1	7.8	120.4	92.2	23.3	4.9	33.7	1.0	1.9	30.8
Basswood	111.3	5.6	83.0	55.0	15.6	12.4	28.3	4.2	8.4	15.7
Silver maple	183.7	9.2	113.9	71.0	21.1	21.8	69.8	24.3	12.0	33.5
Sycamore	2.2	.1	1.7	1.4	.3	5/	.5	-	-	.5
Hackberry	13.6	.7	9.9	4.4	1.5	4.0	3.7	1.9	.3	1.5
Willow	90.0	4.5	61.9	22.6	8.2	31.1	28.1	10.5	7.9	9.7
Other soft hardwoods	60.7	3.0	25.6	12.8	4.9	7.9	35.1	10.6	14.0	10.5
White oak	167.6	8.4	132.5	76.1	24.9	31.5	35.1	10.2	1.3	23.6
Other white oaks	177.6	8.9	112.2	60.0	23.3	28.9	65.4	33.5	3.9	28.0
Northern red oak	166.0	8.4	126.8	84.3	24.5	18.0	39.2	5.4	8.2	25.6
Other red oaks	98.4	5.0	65.6	36.9	12.0	16.7	32.8	10.5	9.0	13.3
Hickory	78.3	3.9	63.6	24.1	7.7	31.8	14.7	7.8	1.7	5.2
White ash	60.1	3.0	45.5	25.3	8.6	11.6	14.6	3.0	2.4	9.2
Sugar maple	38.8	2.0	24.9	15.1	5.0	4.8	13.9	3.0	3.9	7.0
Black walnut	70.7	3.6	52.8	31.6	9.7	11.5	17.9	7.1	2.4	8.4
Other hard hardwoods	29.2	1.5	16.7	8.1	2.5	6.1	12.5	7.2	1.0	4.3
Noncomm. species	2.5	.1	-	-	-	-	2.5	2.5	-	-
Total	1,986.5		1,382.0	797.1	257.0	327.9	604.5	189.4	95.5	319.6
Percent		100.0	69.6	40.1	13.0	16.5	30.4	9.5	4.8	16.1

1/ Central stem between sawlog merchantable top and a point with a minimum diameter of 4 inches inside bark

2/ Sound volume of central stem of sound cull trees

3/ Sound volume of central stem of rotten cull trees

4/ Limbs of both merchantable and cull hardwood trees

5/ Less than 0.05 million cubic feet

TABLE 26 — *Average volume of growing stock per acre by stand-size class and geographic region, Iowa, 1954*

Stand-size class	Board-foot volume			
	Total	Northeastern	Southeastern	Western
Large sawtimber stands	4,541	4,570	3,996	5,093
Small sawtimber stands	3,377	3,293	3,697	2,806
Poletimber stands	600	794	508	538
Seedling and sapling stands	411	636	313	588
Nonstocked and other areas	466	580	472	368
Total	1,962	2,530	1,441	2,135

Stand-size class	Cubic-foot volume			
	Total	Northeastern	Southeastern	Western
Large sawtimber stands	1021.8	1034.0	926.3	1107.8
Small sawtimber stands	997.4	989.5	992.9	1038.9
Poletimber stands	326.6	357.7	311.1	318.3
Seedling and sapling stands	111.5	179.5	87.0	145.1
Nonstocked and other areas	121.8	149.1	127.8	91.7
Total	532.6	667.1	420.0	553.5

TABLE 27 — *Number of sound trees on commercial forest area by species and tree-diameter class, Iowa, 1954*
(Thousands of trees)

Species	Total	Tree-diameter class in inches											
		2	4	6	8	10	12	14	16	18	20	22	24+
Eastern redcedar	4,259	1,217	1,704	615	563	86	50	24	-	-	-	-	-
Black ash	2,265	1,471	-	147	122	244	86	61	73	37	24	-	-
American elm	32,718	5,396	6,140	6,732	3,750	3,615	1,990	1,563	1,245	761	516	395	615
Slippery elm	12,959	249	3,189	3,030	2,195	1,382	972	676	406	455	184	98	123
Aspen	5,709	1,704	1,704	830	608	681	134	24	24	-	-	-	-
Cottonwood	7,531	2,488	1,465	566	418	394	308	357	307	172	246	98	712
Basswood	9,570	535	2,686	1,274	1,537	805	722	588	577	417	196	160	73
Silver maple	15,299	7,906	498	1,530	1,086	1,309	828	506	480	381	197	172	406
Sycamore	36	-	-	24	-	-	-	-	-	-	-	-	12
Hackberry	2,426	736	-	716	495	198	110	61	49	25	-	12	24
Willow	13,115	4,142	1,460	1,606	2,378	1,609	926	589	172	148	12	12	61
Other soft hardwoods	4,322	487	-	1,398	786	514	550	306	147	110	12	-	12
White oak	19,989	1,492	3,969	4,801	2,608	2,407	1,549	1,291	750	517	260	172	173
Other white oaks	22,002	2,195	6,415	4,229	2,504	2,190	1,687	1,084	787	369	247	110	185
Northern red oak	11,235	1,228	487	2,337	1,592	1,420	1,315	968	600	540	281	233	234
Other red oaks	14,012	243	5,938	2,996	1,630	1,080	621	684	293	159	171	61	136
Hickory	45,682	22,577	9,918	6,338	2,708	2,116	1,141	540	282	37	25	-	-
White ash	4,377	243	990	1,008	1,081	466	196	135	123	37	-	-	98
Sugar maple	3,321	492	973	733	514	293	122	73	49	36	12	12	12
Black walnut	7,912	973	1,466	1,405	1,082	886	798	552	467	135	74	37	37
Other hard hardwoods	12,418	5,917	2,463	1,351	616	369	589	360	159	223	160	76	135
Total	251,157	61,691	51,465	43,666	28,273	22,064	14,694	10,442	6,990	4,559	2,617	1,648	3,048

TABLE 28 — *Average 10-year diameter growth by species and tree-diameter class, Iowa, 1954*

Species		Tree diameter class in inches			
		4 - 8	10 - 14	16 - 20	22 +
	Number	*Inches*	*Inches*	*Inches*	*Inches*
Redcedar	4	1.14	2.40	-	-
Black ash	15	.45	1.97	1.47	-
American elm	278	2.32	2.74	2.40	2.79
Slippery elm	128	2.59	2.05	1.87	1.63
Aspen	12	2.35	1.30	-	-
Cottonwood	65	2.60	4.25	3.49	2.98
Basswood	104	1.63	1.94	1.81	1.78
Silver maple	99	3.13	3.91	3.74	3.83
Hackberry	14	1.30	2.43	2.18	3.80
Willow	78	2.88	3.28	3.26	3.60
Other soft hardwoods	58	2.55	1.94	1.68	-
White oak	216	1.79	1.68	1.96	1.93
Bur oak	186	1.21	1.37	1.79	2.17
Other white oaks	16	.88	1.06	2.27	2.75
Black oak	48	2.43	1.60	1.55	3.30
Northern red oak	139	.99	1.56	1.59	2.12
Other red oaks	68	1.76	1.74	1.58	3.11
Hickory	150	1.42	1.31	1.32	-
White ash	55	1.95	1.91	2.00	1.98
Sugar maple	34	1.28	1.67	2.54	2.13
Black walnut	66	2.12	1.83	1.81	2.85
Other hard hardwoods . . .	21	2.43	2.05	2.08	1.60
Total	1,854	1.84	2.11	2.13	2.61

TABLE 29 — *Average annual net board-foot growth by species expressed as a percentage of sawtimber inventory volume, Iowa, 1954*

Species	Growth on original stand less mortality	Ingrowth	Net Growth
	Percent	*Percent*	*Percent*
Eastern redcedar	0.95	3.50	4.45
Black ash	3.97	.51	4.48
American elm	2.84	1.15	3.99
Slippery elm	3.50	1.31	4.81
Aspen	5.40	7.45	12.85
Cottonwood	3.37	.18	3.55
Basswood	2.70	.93	3.63
Silver maple	5.53	1.32	6.85
Sycamore	2.03	2.30	4.33
Boxelder	1.94	6.95	8.89
Butternut	4.80	2.14	6.94
Black cherry	2.19	2.70	4.89
Hackberry	3.29	1.57	4.86
Willow	6.82	1.91	8.73
Other soft hardwoods	6.68	3.44	10.12
White oak	2.63	1.22	3.85
Bur oak	2.49	1.49	3.98
Other white oaks	3.71	1.05	4.76
Black oak	2.63	.98	3.61
Northern red oak	2.24	.64	2.88
Other red oaks	.16	2.25	2.41
Hickory	2.69	2.68	5.37
White ash	2.14	1.20	3.34
Sugar maple	5.98	.88	6.86
River birch	2.93	.62	3.55
Black walnut	4.40	1.31	5.71
Other hard hardwoods . . .	3.86	2.29	6.15
All species	3.23	1.18	4.41

TABLE 30 — *Potential timber volumes and annual net growth in 1965 and 1975. Under certain assumptions as to future timber requirements and progress in forestry.* [1]

	Timber Volume			Annual Net Growth		
	1954	1965	1975	1954	1965	1975
All growing stock: (millions of cubic feet)	1,382	1,837	2,233	68	71	75
Sawtimber only (millions of board feet)	5,092	6,407	7,677	224	247	266

[1] The outlook for timber volumes and net annual growth in 1965 and 1975 is based on assumptions that the annual timber products output in the United States and Iowa will rise with estimated increases in population, national income, and the position of wood in the national economy. Also, that forestry will continue to progress at the rate indicated by recent trends including advances in protection, management, and reforestation. These projections were developed from trends for the entire Central States as prepared for the upper level of future timber requirements shown in the preliminary review draft of the Timber Resource Review. These trends are predicated upon anticipated future timber product demands on the Central States forests, a continuing pattern of reforestation, a "thickening up" of natural stands, and other changes leading to a more productive forest resource.

STANDARD SUMMARY TABLES

As each state throughout the Nation is reported upon by the Forest Survey, a standard set of tables presenting information on forest area, ownership, timber volume, growth and drain are presented. With such tables, forest statistics for any region or group of states can easily be compiled. Standard tables prepared for the State of Iowa, based on the 1954 survey, appear on the following pages. In these tables the northern hardwoods forest type appears as the beech-birch-maple type, to conform to the pattern of national summaries.

TABLE 31 — *Land area by major classes of land, Iowa, 1954*

Class of land	Area	
	Thousand acres	*Percent*
Forest land:		
Commercial	2,595	7.2
Noncommercial:		
Productive —		
reserved from timber use	25	.1
Unproductive	0	.0
Total forest land	2,620	7.3
Nonforest land	33,249	92.7
Total all classes	35,869	100.0

TABLE 32 — *Commercial forest area by ownership and stand-size class, Iowa, 1954*
(In thousand acres)

Ownership class	Total	Large sawtimber stands	Small sawtimber stands	Pole-timber stands	Seedling & sapling stands	Nonstocked and other areas
Federal:						
National Forest	2.7	0.2	0.1	2.2	0.2	-
Indian	1.0	.1	.1	.6	.2	-
Other	9.2	2.5	1.0	3.5	2.1	0.1
Total	12.9	2.8	1.2	6.3	2.5	.1
State	22.0	5.7	2.4	7.2	2.8	3.9
County and Municipal	1.9	.3	.2	1.0	.3	.1
Private:						
Farm	2,282.1	654.3	238.8	726.8	247.4	414.8
Industrial and other	276.1	74.9	25.4	88.7	34.0	53.1
Total	2,558.2	729.2	264.2	815.5	281.4	467.9
All ownerships	2,595	738	268	830	287	472

TABLE 33 – *Area of commercial forest land by major forest types, Iowa, 1954*

Forest type	Thousand acres
Oak hickory	1,036
Maple-beech-birch	78
Elm-ash-cottonwood	1,219
Aspen-birch	20
Bur oak	202
Hardwood-redcedar	40
Total	2,595

TABLE 34 – *Net volume of live sawtimber and growing stock on commercial forest land by stand-size class, Iowa, 1954*

Stand-size class	Sawtimber	Growing stock
	Million board-feet	*Million cubic feet*
Sawtimber stands	4,257	1,021.4
Poletimber stands	497	271.1
Seedling and sapling stands	118	32.0
Nonstocked and other areas	220	57.5
Total	5,092	1,382.0

TABLE 35 – *Net volume of live sawtimber and growing stock on commercial forest land by ownership class, Iowa, 1954*

Ownership class	Volume	
	Sawtimber	Growing Stock
	Million board-feet	*Million cubic feet*
Federal:		
National Forest	4	1.1
Indian	3	0.7
Other	21	5.7
Total	28	7.5
State	40	11.4
County and Municipal	3	1.0
Private:		
Farm	4.515	1,225.0
Industrial and other	506	137.1
Total	5,021	1,362.1
All ownerships	5,092	1,382.0

TABLE 36 – *Net volume of live sawtimber and growing stock on commercial forest land by species, Iowa, 1954*

Species	Volume	
	Sawtimber	Growing Stock
	Million board-feet	*Million cubic feet*
Softwoods:		
Eastern redcedar	6	3.8
Total softwoods	6	3.8
Hardwoods:		
White oaks	504	132.5
Red oaks	532	126.8
Other white oaks	383	112.2
Other red oaks	231	65.6
Sugar maple	98	24.9
Soft maple	462	113.9
Ash	200	56.9
Hickory	155	63.6
Cottonwood	601	120.4
Black walnut	193	52.8
Other eastern hardwoods	1,727	508.6
Total hardwoods	5,086	1,378.2
All species	5,092	1,382.0

TABLE 37 – *Net volume of live sawtimber on commercial forest land by diameter class groups and species, Iowa, 1954*
(In million board-feet)

Species	Total	Tree diameter class (inches)		
		12-14	16-18	20+
Softwoods:				
Eastern redcedar	6	6 1/	-	-
Total	6	6	-	-
Hardwoods:				
White oaks	504	198	166	140
Red oaks	532	147	174	211
Other white oaks	383	144	113	126
Other red oaks	231	84	64	83
Sugar maple	98	35	26	37
Soft maple	462	86	124	252
Ash	200	57	55	88
Hickory	155	108	43	4
Cottonwood	601	53	85	463
Black walnut	193	85	76	32
Other eastern hardwoods	1,727	537	575	615
Total	5,086	1,534	1,501	2,051
All species	5,092	1,540	1,501	2,051

1/ Includes 10" softwood sawtimber

TABLE 38 – *Net volume of all timber on commercial forest land, by class of material and species group, Iowa, 1954*
(In million cubic feet)

Class of material	Total	Softwoods	Hardwoods
Growing stock:			
Sawtimber trees:			
Sawlog portion	797.1	1.0	796.1
Upper stem portion	257.0	0.2	256.8
Total	1,054.1	1.2	1,052.9
Poletimber trees	327.9	2.6	325.3
Total growing stock	1,382.0	3.8	1,378.2
Other material:			
Sound cull trees	189.4	-	189.4
Rotten cull trees	95.5	-	95.5
Hardwood limbs	319.6	-	319.6
Salvable dead trees	-	-	-
Total other material	604.5	-	604.5
Total all timber	1,986.5	3.8	1,982.7

TABLE 39 – *Net annual growth, annual mortality and annual cut of live sawtimber and growing stock on commercial forest land by species groups, Iowa, 1954*

Item	Sawtimber			Growing Stock		
	Total	Softwoods	Hardwoods	Total	Softwoods	Hardwoods
	Million board-feet			*Million cubic feet*		
Net annual growth	224.3	0.3	224.0	67.9	0.2	67.7
Annual Mortality	26.6	.1	26.5	8.2	1/	8.2
Annual cut:						
Timber products	98.7	1.2	97.5	20.6	.3	20.3
Logging residues	3.9	-	3.9	1.4	-	1.4
Total	102.6	1.2	101.4	22.0	.3	21.7

1/ Less than .05 million cubic feet

TABLE 40 – *Output of timber products and annual cut of live sawtimber and growing stock, Iowa, 1953*

Product	Output of Timber Products 1/					Annual Cut of Sawtimber (Thousand Board-feet 2/)			Annual Cut of Growing Stock (Thousand Cubic-feet)		
	Volume in standard units		Roundwood volume (Thousand Cubic-feet)								
			Total	Softwoods	Hardwoods	Total	Softwoods	Hardwoods	Total	Softwoods	Hardwoods
	Units	*Number*									
Sawlogs	M bd.-ft. 2/	65,000 3/	9,600	240	9,360	67,500	1,200	66,300	12,000	275	11,725
Veneer logs and bolts	M bd.-ft.	4,700	700	-	700	4,900	-	4,900	830	-	830
Cooperage logs & bolts	M bd.-ft.	3,500	500	-	500	3,600	-	3,600	620	-	620
Pulpwood	Std. Cords 4/	3,200	200	-	200	260	-	260	200	-	200
Fuelwood	Std. Cords	383,400	24,000	-	24,000	20,000	-	20,000	7,400	-	7,400
Posts	M pieces	2,400	1,200	-	1,200	3,700	-	3,700	610	-	610
Miscellaneous	M Cu. ft.	400	400	-	400	2,600	-	2,600	380	-	380
Total	xxxx	xxxx	36,600	240	36,360	102,560	1,200	101,360	22,040	275	21,765

1/ Includes material from both growing stock and other miscellaneous sources

2/ International 1/4-inch rule

3/ Sawlog production is based on several independent studies of timber cut in Iowa in the period 1952 – 1954

4/ Roughwood basis

Agriculture
BEAVER PRESS
COLUMBUS, OHIO
Columbus, Ohio

Acknowledgment

This is the final report of the findings of the initial Forest Survey in Iowa. A preliminary report including timber volume and forest area statistics was released in July 1956. These publications are products of the nationwide Forest Survey being made by the Forest Service, U. S. Department of Agriculture.

The preliminary planning and a large part of the field work were done by personnel of the Central States Forest Experiment Station at Columbus, Ohio. Compilation of data and preliminary report preparation were done at the Lake States Forest Experiment Station at St. Paul, Minnesota. This final report is the result of a cooperative effort by both organizations.

Field work in Iowa was done in the period November 1953 to August 1954. From initial planning to final compilation, the following people took part in this inventory:

Supervision and planning—R. N. Cunningham, J. T. Morgan.

Photo interpretation—K. E. Moessner, P. L. Thornton.

Field inventory—P. L. Thornton, J. D. Burton, A. R. Eschner, N. J. Hansen, K. Kuusela, M. J. Peterson, W. C. Ritter, D. E. Stoppel.

Statistical Computations—L. F. Compton, C. E. Jensen, M. K. Peirsol.

Timber-cut estimates—O. K. Hutchison, A. L. Hartong.

The Forest Survey in Iowa was intensified beyond the accuracy required for national compilations (and thus made more useful locally) through the cooperation of two State agencies. The State Conservation Commission and the Iowa Agricultural Experiment Station aided in the field inventory. This assistance made possible measurements of twice as many ground plots as originally planned. Complete aerial photo coverage of the State was loaned by the Iowa Agricultural Stabilization Committee at Des Moines.

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